GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

(An Autonomous Institute of Govt. of Maharashtra)

EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIRST** PROGRAM: **COMMON**

COURSE CODE: **CCE105/X104/R107/0107** COURSE NAME: **BASIC MATHEMATICS**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **30/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** **(08)**

a) Resolve into partial fractions: $\frac{x+1}{(x+3)(x-2)}$

b) Resolve into partial fractions: $\frac{x}{x^2-1}$

c) Find X if $\begin{bmatrix} 4 & 5 \\ -3 & 6 \end{bmatrix} + x = \begin{bmatrix} 10 & -1 \\ 0 & -5 \end{bmatrix}$

d) Find x & y if $\begin{bmatrix} 3x^2 & 4 \\ 1 & y-3 \end{bmatrix} = \begin{bmatrix} 12 & 4 \\ 1 & 8 \end{bmatrix}$

e) If $A = \begin{bmatrix} 2 & 3 \\ 4 & 7 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$ find 2A+3B-4I

f) Find the middle term in the expansion of $(x+5)^8$

Q.2 Attempt any **FOUR** **(16)**

a) Solve using determinants: $x+y+z=1;\quad 2x+3y+z=4;\quad 4x+9y+z=16$

b) Prove using properties that $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a)$

c) Resolve into partial fractions: $\frac{x^2+2x}{(x-3)(x^2+1)}$

d) Express the matrix 'A' as the sum of symmetric and skew-symmetric matrices $A = \begin{bmatrix} -1 & 7 & 1 \\ 2 & 3 & 4 \\ 5 & 0 & 5 \end{bmatrix}$

e) If $A = \begin{bmatrix} -1 & 3 & 5 \\ 0 & 6 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -5 \\ 7 & 8 \\ 1 & -1 \end{bmatrix}$, $C = \begin{bmatrix} 4 & -5 \\ 1 & 1 \end{bmatrix}$, *verify that* $(AB)C = A(BC)$

f) Find A^{-1} by adjoint method if $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$

Q.3 Attempt any **FOUR** **(16)**

a) Solve the following equation $\begin{vmatrix} x+10 & x+2 & x+3 \\ x+4 & x+5 & x+6 \\ 2x+7 & x+8 & 0 \end{vmatrix} = 0$

b) Resolve into partial fractions: $\frac{x^2+x+1}{(x+1)^2(x+2)}$

c) Resolve into partial fractions: $\frac{2x^4+x^2+4}{(x^2+1)(2x^2+3)(x^2-2)}$

d) Solve the following simulations equations by matrix method: 2x+y=3; 2y+3z=4; 2z+2x=8

e) Using Binomial theorem prove that $\left(\sqrt{2}+1\right)^5-\left(\sqrt{2}+1\right)^5=82$

f) The term independent of x in the expansion of $\left(x^3+\frac{m}{x^8}\right)^{11}$ is 1320 find m.

Q.4 Attempt any **FOUR** **(08)**

a) Prove that as $\cos(\pi+\theta)=-\cos\theta$

b) If A=30^0 verify that $\sin 3A=3\sin A-4\sin^3 A$

c) Express as product and evaluate $\sin 99^0-\sin 81^0$

d) Prove that a=b cos c + C cosB

e) Find principal value of $\cos^{-1}\left(-\frac{1}{2}\right)-\sin^{-1}\left(\frac{1}{2}\right)$

f) In ΔABC if a=125cm, b=123cm, c=62cm find $\sin\frac{A}{2}$

Q.5 Attempt any **FOUR** **(16)**

a) If $\tan(x+y)=\frac{3}{4}$, $\tan(x-y)=\frac{8}{15}$ *them show that* $\tan 2x=\frac{77}{36}$

b) Prove that $\frac{\sec 8A-1}{\sec 4A-1}=\frac{\tan 8A}{\tan 2A}$

c) Prove that $\frac{\sin 4A+\sin 5A+\sin 6A}{\cos 4A+\cos 5A+\cos 6A}=\tan 5A$

d) Prove that $\tan^{-1}\left(\frac{1}{7}\right)+\tan^{-1}\left(\frac{1}{13}\right)=\cot^{-1}\left(\frac{9}{2}\right)$

e) Prove that $\left(b^2-c^2\right)\sin^2 A+\left(c^2-a^2\right)\sin^2 B+\left(a^2-b^2\right)\sin^2 c=0$

f) Solve ΔABC *if* $b=1,\ c=\sqrt{3}-1$ & $A=60^0$

Q.6 Attempt any **FOUR** **(16)**

a) If α and β both are obtuse angles and $\sin\alpha=\frac{5}{13}$, $\cos\beta=\frac{-4}{5}$ *evaluate* $\cos(\alpha+\beta)$

b) Prove that $4\sin A\sin(60^0-A)\sin(60^0+A)=\sin 3A$

c) Show that $\cos^{-1}\left(\frac{4}{5}\right)+\tan^{-1}\left(\frac{3}{5}\right)=\tan^{-1}\left(\frac{27}{11}\right)$

d) In ΔABC *show that* $\tan A+\tan B+\tan C=\tan A\tan B\tan C$

e) Solve ΔABC in which the sides are a=52.8, b=39.3, c=72.1

f) In any ΔABC, prove that $a\cos\left(\frac{B-C}{2}\right)=(b+c)\sin\frac{A}{2}$

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FIFTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE503/ME404**

COURSE NAME :- **QUALITY MANAGEMENT**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **30 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
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Section – I

Marks

Q.1 Attempt any **FOUR** (08)

a) Enlist two functions of inspection.

b) Define durability and serviceability.

c) What is quality assurance?

d) How members of quality circle are selected?

e) What are external failure costs?

f) Why increasing the quality of design leads to higher costs?

Q.2 Attempt any **FOUR** (16)

a) List the main categories of product feature and freedom from deficiencies for manufacturing and service industry.

b) Define maintainability. Give general approaches for improving maintainability of a design.

c) Explain the role of middle management for ensuring quality of the product.

d) Explain the need of inspection.

e) Give the factors considered to determine the location of inspection station during inspection planning.

f) Discuss "Prevention cost" category of quality costs.

Q.3 Attempt any **FOUR** (16)

a) Define quality Audits. Give the purpose of quality audits.

b) Give the details of items to be included in autitors report.

c) Explain the concept of 'quality circle'.

d) Discuss the role of management for supporting quality circle activity.

e) Discuss the "appraisal cost" category of quality costs.

f) Differentiate clearly between quality of design and quality of conformance.

P.T.O.

Section – II	Marks

Q.4 Attempt any **FOUR** (08)

a) Define standard deviation.

b) What is normal distribution curve?

c) Define TQM.

d) List tools of TQM.

e) What is Pareto diagram?

f) What is histogram?

Q.5 Attempt any **FOUR** (16)

a) Explain concept of process capabilities.

b) State the different benefits of SQC and explain.

c) Give the steps to construct Histogram.

d) Give the purpose of 'X' and 'R' control chart.

e) Explain Deming philosophy of TQM.

f) Explain the "Kaizan".

Q.6 Attempt any **FOUR** (16)

a) List the principles of TQM and explain any one.

b) What are advantages of TQM implimention?

c) Explain process flow diagram.

d) What is the purpose of Bench marking?

e) State the quality management principle of ISO 9000:2000.

f) What is theory of 5S?

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EVEN TERM END EXAM APRIL/MAY. -2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **THIRD** PROGRAM : **APPLIED**
COURSE CODE :- **MEE312/MTE312/ME213/R227/MG227**
COURSE NAME :- **NON CONVENTIONAL ENERGY SOURCES**
MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **02 / 05 / 2016**

Instruction :-
1) Answers must be written in the main answer book provided.(and supplements if required)
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
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Marks

Q.1 Attempt any **FOUR** (08)

a) Enlist four non-covventional energy sources.

b) Define i) Altitude angle ii) Zenith angle.

c) State the purpose of 'pyranometer'.

d) State the principle of wind energy conversion.

e) State the four advantages of wind power.

f) Enlist any four parts of horizontal axis Wind Mill.

Q.2 Attempt any **FOUR** (16)

a) Differentiate between conventional and non-conventional sources of energy.

b) Draw a neat sketch of solar pond and explain its working.

c) Classify wind mills.

d) State the purpose of i) Yaw control mechanism and
ii) Pitch control mechanism used in horizontal axis Wind Mill.

e) Define 'Biomass'. Why biomass energy is considered as a 'form of solar energy'?

f) Draw a neat sketch of fixed dome type biogas plant and name its parts.

Q.3 Attempt any **FOUR** (16)

a) Draw a neat sketch of 'sunshine recorder' and explain its working.

b) Draw a neat sketch of 'Liquid flat-plate collector ' and explain its working.

c) State the principle of solar photo-voltaic conversion. Enlist any four applications of solar photo-voltaic systems.

d) State any four advantages of concentrating collectors over flat plate collectors.

e) Describe safety system in wind energy.

f) Differentiate between biomass and 'conventional fuels'.

P.T.O.

Q.4 Attempt any **FOUR** (08)

a) State the principle of tidal power.

b) State the purpose of specific energy consumption.

c) What is waste heat?

d) State the components of tidal power plant.

e) State the limitations of geothermal energy.

f) What is magnetohydrodynamic (MHD) generation?

Q.5 Attempt any **FOUR** (16)

a) State the applications of fuel cell.

b) Explaim Sankey diagram for IC engine.

c) How waste heat is recovered in economiser?

d) State the advantages of tidal power generation.

e) Draw a layout of micro-hydro power station.

f) Discuss the principle of magento-hydrodynamic power generation.

Q.6 Attempt any **TWO** (16)

a) Define energy audit. Classify it and explain.

b) How fuel cells are classified?

c) Explain with neat sketch double basin tidal power plant.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: THRID PROGRAM: CE/ME/IE/E&TC/SM/MT/IT

COURSE CODE:

MEE313/MTE312/ME214/R228/MG228/ITE312/R228/IEE/ETE312/IX/EJ210/R228/0228

COURSE NAME: HIGHER MATH'S

MAX. MARKS: 80 TIME: 3 HRS. DATE: 02/05/2016

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
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Marks

Q.1 Attempt any **FOUR** **(08)**

a) Evaluate $\left(\frac{\Delta^2}{E}\right)x^2$ *taking* $h=1$

b) Prove that $E\Delta = \Delta E$

c) Prove that $\Delta \log f(x) = \log\left[1+\frac{\Delta f(x)}{f(x)}\right]$

d) If $z=\log(x^2+y^2)$. *find* $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$

e) If $z=x^y$, *then find* $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$

f) If $u=\sin(xy)$, *find* $\frac{\partial^2 u}{\partial x.\partial y}$

Q.2 Attempt any **FOUR** **(16)**

a) Estimate the missing term in the following table.

X	1	2	3	4	5
Y	2	5	7	-	32

b) Express $f(x)=2x^4+x-1$ in factorial notation & find $\Delta^3 f(x)$ *at* $x=1.5$

c) If f(x)is a polynomial of degree 2 in x If f(0)=8, f(1)=12, f(2)=18 then find f(x) using suitable interpolation formula.

d) The following table gives the premium payable for the policy of RS.1000 at age x.

Age	20	25	30	35	40
Premium	23	26	30	35	41

Find the premium, if the policy is taken at the age of 26 years.

e) Find f(1.7), if f(-2)=4, f(-1)=26, f(0)=58, f(1)=112, f(2)=446

f) Using Lagrange's formula, find f(6)

X	3	7	9	10
Y	168	120	72	63

Q.3 Attempt any **FOUR** **(16)**

a) If $z=\sin^{-1}\left(\frac{y}{x}\right)$, *verify that* $\frac{\partial^2 z}{\partial x.\partial y}=\frac{\partial^2 z}{\partial y.\partial x}$

b) If $\sin U=\frac{x^2y^2}{x+y}$ *show that* $x\frac{\partial u}{\partial x}+y.\frac{\partial u}{\partial y}=3\tan u$

P.T.O.

c) If $u = x^2.\tan^{-1}\left(\frac{y}{x}\right) - y^2.\tan^{-1}\left(\frac{x}{y}\right)$ *show that* $\frac{\partial^2 u}{\partial x.\partial y} = \frac{x^2 - y^2}{x^2 + y^2}$

d) If $x = r\cos\theta,\ y = r\sin\theta,$ *find* $\frac{\partial(x,y)}{\partial(r,\theta)}$

e) If $x = e^U.\cos V$ *and* $y = e^U.\sin V$ *prove that* $\frac{\partial(x,y)}{\partial(U,V)}\ X\ \frac{\partial(U,V)}{\partial(x,y)} = 1$

f) If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$ *then prove that* $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x.\partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \sin 4U - \sin 2U$

Q.4 Attempt any **FOUR** **(08)**

a) Solve $(D^2 - 5D^2 + 8D - 4)y = 0$

b) Solve $(D^4 + 8D^2 + 16)y = 0$

c) Find C-F of $(D^3 + 1)y = e^x$

d) Solve $(D^2 - 4D + 13)y = 0$

e) An unbiased coin is tossed 5 times. Find the probability of getting a head.

f) Is a random variable has a Poisson's distribution such that P(1) = P(2) find P(4)

Q.5 Attempt any **FOUR** **(16)**

a) Evaluate $(D^3 - 2D^2 - 5D + 6)y = (e^{2x} + 3)^2$

b) Evaluate $(D^4 + 8D^2 + 16)y = \sin^2 x$

c) Evaluate $(D^2 + 2D + D)y = x^2 + x$

d) If 20% of the bolts produced by a machine are defective then determine the probability that out of 4 bolts. Drawn at the most, two are defective.

e) If the probability of bad reaction from a certain injection is 0.001, determine the chance that out of 2000 individuals more than two will get a bad reaction, using Poisson distribution.

f) Maximize $z = 150x + 250y$ *subject to*, $4x + y \le 40,\quad 3x + 2y \le 60,\quad x \ge 0,\ y \ge 0$

Q.6 **A)** Attempt any **ONE** **(16)**

a) Solve $D^2(D^2 + 1)y = \sin x + e^{-x}$

b) Sack of sugar packed by an automatic loader have an average weight of 100kg with standard deviation 0.250kg. Assuming normal distribution, find the chance of sack yet weighing less than 99.5kg. (S.H.V. area z=0 to z=2 is 0.4772)

c) If 2% of the electric bulbs manufactured by a company are defective. Find the probability that in a sample of 100 bulbs 3 bulbs will be defective.

B) Attempt any **ONE**

a) A manufacturer produces bulbs & tubes. It takes 1 hour of work on machine M_1 & 3 hours at work on machine M_2 to produce one package of bulbs. While it takes 2 hours on machine M_1 & 4 hours on machine M_2 to produce a package of tubes .He earns a profit of Rs 13.50 per package of bulbs & Rs55 per package of tubes. How many package of each item should be produced each day so as to maximize his profit, if he operates the machine M_1 for at most 10 hours a day & machine M_2 for at most 12 hours a day? From the LPP & solve it graphically.

b) A doctor has prescribed two different kinds of foods A & B from weekly diet for a sick person. The minimum requirement of fats, carbohydrates and protein are 18, 28, 14 units respectively. One unit of food A has 4 units of fat, 14 units of carbohydrates and 7 units of protein. One unit of food B has 6 units of fat, 12 units of carbohydrates and 8 units of protein. The price of food A is Rs4.5 per unit and that of food B is 3.5 per unit. Form & solve graphically the LPP, so that the sick person's diet meets the requirements at a minimum cost.

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MAX. MARKS: **80** TIME: **3 HRS.** DATE: **02/05/2016**

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Marks

Q.1 Attempt any **FOUR** **(08)**

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b) Prove that $E\Delta = \Delta E$

c) Prove that $\Delta \log f(x) = \log\left[1+\frac{\Delta f(x)}{f(x)}\right]$

d) If $z=\log(x^2+y^2)$. *find* $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$

e) If $z=x^y$, *then find* $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$

f) If $u=\sin(xy)$, *find* $\frac{\partial^2 u}{\partial x.\partial y}$

Q.2 Attempt any **FOUR** **(16)**

a) Estimate the missing term in the following table.

X	1	2	3	4	5
Y	2	5	7	-	32

b) Express $f(x)=2x^4+x-1$ in factorial notation & find $\Delta^3 f(x)$ *at* $x=1.5$

c) It f(x)is a polynomial of degree 2 in x If f(0)=8, f(1)=12, f(2)=18 then find f(x) using suitable interpolation formula.

d) The following table gives the premium payable for the policy of RS.1000 at age x.

Age	20	25	30	35	40
Premium	23	26	30	35	41

Find the premium, if the policy is taken at the age of 26 years.

e) Find f(1.7), if f(-2)=4, f(-1)=26, f(0)=58, f(1)=112, f(2)=446

f) Using Lagrange's formula, find f(6)

X	3	7	9	10
Y	168	120	72	63

Q.3 Attempt any **FOUR** **(16)**

a) If $z=\sin^{-1}\left(\frac{y}{x}\right)$, *verify that* $\frac{\partial^2 z}{\partial x.\partial y}=\frac{\partial^2 z}{\partial y.\partial x}$

b) If $\sin U=\frac{x^2y^2}{x+y}$ *show that* $x\frac{\partial u}{\partial x}+y.\frac{\partial u}{\partial y}=3\tan u$

P.T.O.

Q.3 Attempt any **FOUR** **(16)**

a) If $z=\sin^{-1}\left(\frac{y}{x}\right)$, *verify that* $\frac{\partial^2 z}{\partial x.\partial y}=\frac{\partial^2 z}{\partial y.\partial x}$

b) If $\sin U=\frac{x^2y^2}{x+y}$ *show that* $x\frac{\partial u}{\partial x}+y.\frac{\partial u}{\partial y}=3\tan u$

c) If $u=x^2.\tan^{-1}\left(\frac{y}{x}\right)-y^2.\tan^{-1}\left(\frac{x}{y}\right)$ *show that* $\frac{\partial^2 u}{\partial x.\partial y}=\frac{x^2-y^2}{x^2+y^2}$

d) If $x=r\cos\theta$, $y=r\sin\theta$, *find* $\frac{\partial(x,y)}{\partial(r,\theta)}$

e) If $x=e^U.\cos V$ *and* $y=e^U.\sin V$ *prove that* $\frac{\partial(x,y)}{\partial(U,V)}X\frac{\partial(U,V)}{\partial(x,y)}=1$

f) If $u=\tan^{-1}\left(\frac{x^3+y^3}{x-y}\right)$ *then prove that* $x^2\frac{\partial^2 u}{\partial x^2}+2xy\frac{\partial^2 u}{\partial x.\partial y}+y^2\frac{\partial^2 u}{\partial y^2}=\sin 4U-\sin 2U$

Q.4 Attempt any **FOUR** **(08)**

a) Evaluate $L\{\sin 2t.\sin t\}$

b) Find the Fourier constant a_0 for the function $f(x)=e^{ax}$ in $(0,2\pi)$ where $a\neq 0$

c) Evaluate $L\{e^{-t}\cos 2t\}$

d) Evaluate $L^{-1}\left\{\frac{1}{(s+1)^2}\right\}$

e) Evaluate $L^{-1}\left\{\frac{1}{s^2+5s+6}\right\}$

f) Find a_0 for Fourier series expansion for the function $f(x)=x+x^2$ *in* $(-\pi,\pi)$

Q.5 Attempt any **FOUR** **(16)**

a) Find the inverse Laplace transform of $\frac{1}{(s+2)(s+4)}$ using convolution theorem.

b) Solve the differential equation using Laplace transform.
$\frac{d^2y}{dt^2}-\frac{dy}{dt}-2y=e^{-t}$, $y(0)=-3$ & $y'(0)=0$

c) Find $L\{t^2e^{4t}\sin t\}$

d) Find $L^{-1}\left\{\frac{3s+2}{(4s+3)(2s+7)}\right\}$

e) Find $L\{\sin^2(3t).e^{4t}\}$

f) $L^{-1}\left\{\frac{4}{s+3}-\frac{s+2}{s^2-2s-3}\right\}$

Q.6 Attempt any **TWO** **(16)**

a) Find a Fourier series to represent $f(x)=x^2$ *in* $(0,2\pi)$ & Hence deduce that
$\frac{\pi^2}{12}=\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+------$

b) Obtain Fourier series expansion for the function
$f(x)=x+\frac{\pi}{2}, -\pi<x<0$
$=\frac{\pi}{2}-x, \quad 0<x<\pi$

Hence deduce, $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+----$,

c) Find the Fourier series expansion of $f(x)=x, \quad 0<x<1$
$=1-x, \quad 1<x<2$

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LEVEL: **THRID** PROGRAM: **CE/ME/IE/E&TC/SM/MT/IT**

COURSE CODE:

MEE313/MTE312/ME214/R228/MG228/ITE312/R228/IEE/ETE312/IX/EJ210/R228/0228

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MAX. MARKS: **80** TIME: **3 HRS.** DATE: **02/05/2016**

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Marks

Q.1 Attempt any **FOUR** **(08)**

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x	3	7	9	10
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P.T.O

Q.3 Attempt any **FOUR** **(16)**

a) If $z = \sin^{-1}\left(\frac{y}{x}\right)$, *verify that* $\frac{\partial^2 z}{\partial x.\partial y} = \frac{\partial^2 z}{\partial y.\partial x}$

b) If $\sin U = \frac{x^2 y^2}{x+y}$ *show that* $x\frac{\partial u}{\partial x} + y.\frac{\partial u}{\partial y} = 3\tan u$

c) If $u = x^2.\tan^{-1}\left(\frac{y}{x}\right) - y^2.\tan^{-1}\left(\frac{x}{y}\right)$ *show that* $\frac{\partial^2 u}{\partial x.\partial y} = \frac{x^2 - y^2}{x^2 + y^2}$

d) If $x = r\cos\theta,\ y = r\sin\theta,$ *find* $\frac{\partial(x,y)}{\partial(r,\theta)}$

e) If $x = e^U.\cos V$ *and* $y = e^U.\sin V$ *prove that* $\frac{\partial(x,y)}{\partial(U,V)}\ X\ \frac{\partial(U,V)}{\partial(x,y)} = 1$

f) If $u = \tan^{-1}\left(\frac{x^3 + y^3}{x - y}\right)$ *then prove that* $x^2\frac{\partial^2 u}{\partial x^2} + 2xy\frac{\partial^2 u}{\partial x.\partial y} + y^2\frac{\partial^2 u}{\partial y^2} = \sin 4U - \sin 2U$

Q 4 Attempt any **FOUR** **(08)**

a) Find L(f(t)) by using definition if $f(t) = 3,\ 0 < t < 5$
$= 0,\ t > 5$

b) Find $L\left(e^{2+3t}\right)$

c) Find $L\left(\cos^3 2t\right)$

d) Find $L^{-1}\left(\frac{2}{s} + \frac{1}{s^3} + \frac{1}{s^2+4}\right)$

e) Find $L^{-1}\left(\frac{1}{(s-3)^3}\right)$

f) Find $\left(D^3 - 1\right)y = 0$

Q 5 Attempt any **FOUR** **(16)**

a) Find $L\left(t\ e^t \sin 2t\cos t\right)$

b) Find $L\ \ L\left(\frac{e^{-3t}\sin 2t}{t}\right)$

c) Find by L.T method the value of $\int_0^\infty e^{-3t} t\sin t\ dt$

d) Find $L^{-1}\left(\frac{s+29}{(s+4)(s^2+9)}\right)$

e) Using convolution theorem find $L^{-1}\left(\frac{1}{s(s+4)}\right)$

f) Solve $\frac{d^3y}{dx^3} - 4\frac{d2y}{dx^2} + 5D - 2 = 0$

Q 6) **A)** Attempt Any **TWO** **08**

a) Solve $\left(D^3 - 3D^2 + 4\right)y = 0$

b) Solve $\frac{d^4y}{dx^4} + 6\frac{d^2y}{dx^2} + 9 = 0$

c) Solve $\frac{d^3y}{dx^3} + y = 0$

B) Attempt Any **ONE** **08**

a) Solve by using L.T. Method $\left(D^2 - 3D + 2\right)y = 4e^{2t}$ *given that* $y^x(0) = -3$ *and* $y'(0) = 5$

b) $\left(D^2 - D - 2\right)y = 20\sin 2t$ *given that* $y(0) = 1$ *and* $y'(0) = 2$

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIRST** PROGRAM: **COMMON**

COURSE CODE: **CCE107/X105/E109** COURSE NAME: **ENGINEERING DRAWING-I**

MAX. MARKS: **80** TIME: **4 HRS.** DATE: **29/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Q.1 Attempt any **FOUR** **Marks (08)**

a) Write Auto CAD command for the following
   i) To draw line of 40mm
   ii) To draw circle of radius 25mm

b) State the applications of parabola.

c) If point B is in the V.P. and 35mm above H.P. Draw its projection.

d) Draw conventions/ symbols for the following.
   i) Long brake line
   ii) Center line

e) A 2cm long line on a drawing represents a distance of 1 meter calculate Representative Fraction (R.F)

f) State the uses of the following drawing instrument.
   i) Set squares
   ii) French curves.

Q.2 Attempt any **FOUR** **(16)**

a) Construct parabola by rectangle method, given the base 100mm and height 70mm.

b) Draw direct (external) common tangent to two unequal circles of radius 25mm and 35mm respectively. The distance between the centers of two circles is equal to 100mm.

c) A string is unwound from a circle of 30mm radius. Draw the Involute of a circles the end of a string for unwinding the string completely. String is kept tight while being unwound.

d) The length of the top view of line parallel to VP and inclined at 45^0 to the H.P is 50mm. One end of the line is 12mm above the HP and 25mm in front of V.P. Draw the projection of the line and determine its true length.

e) Construct an ellipse by Arcs of circle method, given the major axis and minor axis 80mm and 50mm respectively.

f) The distance between end projections of a line PQ 100mm long is 80mm. The line is parallel to H.P. The end P is 15mm above H.P and 35mm in front of V.P Draw projections of line PQ and find inclination with V.P.

Q.3 Attempt any **TWO** **(16)**

a) Draw a cycloid of a circle of 50mm diameter.

b) Construct and Archemedian spiral for one convolution, given the greatest and least radii being 70mm and 15mm respectively.

P.T.O

c) A straight line AB 60mm long makes an angle of 55^0 to the H.P and 25^0 to the V.P The one end of the straight line AB is in the H.P and 20mm in front of V.P. Draw the projection of line AB.

Q.4 Attempt any **TWO** **(08)**

a) An isosceles triangle of base 30mm and attitude 50mm is having its base on H.P. plane is perpendicular to V.P and is inclined to H.P. in such a way that top view appears to be an equilateral triangle. Draw three views of plane.

b) A circular plate of diameter 60mm is resting on the V.P on a point of its circumference. The plate is inclined to V.P. in such a way that the elevation length of diameter (minor axis) passing through the point on V.P is 35mm, The plate is perpendicular to H.P. Draw its three views of the plate.

c) A pentagonal plate of 30mm side is resting on one of the side on H.P such that plate is inclined at 40^0 with H.P. and perpendicular to V.P. The center of plate is 50mm from V.P. draw its three views.

Q.5 Attempt any **TWO** **(16)**

a) A pentagonal prism having base side 30mm and axis 60mm long is resting on H.P on one of its base edge. Draw the projections of prism if the face containing that edge makes an angle of 60^0 with the H.P and its axis is parallel to V.P.

b) A cylinder having its base diameter 40mm and axis length 60mm is kept on the V.P on a point of its base circle such that its axis is inclined to V.P at 30^0 and parallel to H.P. Draw the projections of the cylinder.

c) A square pyramid side of the base 30mm and height 50mm is resting on its base with one of the sides of the base perpendicular to the V.P. It is cut by on AIP inclined at 45^0 to the H.P. in such a way that it bisects the axis. Draw F.V. sectional T.V. and true shape of section

i)	F.V.	(02 Marks)
ii)	Sectional T.V.	(02 Marks)
iii)	True shape	(04 Marks)

Q.6 Attempt any **TWO** **(16)**

a) A right circular cylinder of 60mm base diameter and axis 100mm long is resting on the ground on its base. It is cut by a section plane perpendicular to V.P. and inclined to H.P (or ground) in such a way that the true shape of section is an ellipse having major axis 80mm. Draw

i)	Front view	(02 Marks)
ii)	Sectional Top view	(02 Marks)
iii)	True shape of section	(04 Marks)

b) A cone of base diameter 40mm and axis length 50mm is kept on the H.P. on its base. It is cut by an AIP inclined at 45^0 to the H.P. and passes through a point on the axis 30mm above the base. Draw

i)	Front view	(02 Marks)
ii)	Sectional Top view	(02 Marks)
iii)	True shape of section	(04 Marks)

c) A cone of base diameter 40mm and axis length 60mm is kept on the V.P. on a point of its base circle such that its axis inclined to V.P. at 30^0 and parallel to H.P. Draw the projections of cone.

Stage I	i) F.V	(01 Marks)
	ii) T.V	(01 Marks)
Stage II	i) F.V	(03 Marks)
	ii) T.V	(03 Marks)

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE : **MEE310/ME210/M210/2213**

COURSE NAME : **ENGG. METALLURGY & MATERIALS**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **29/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Q.1 Attempt any **FOUR** **Marks (08)**

a) What is extractive metallurgy.
b) What is a unit cell?
c) Which are the different crystal structures? Draw HCP crystal structure.
d) State various applications of engineering materials.
e) State the properties of cast iron.
f) Give classification of steel.

Q.2 Attempt any **FOUR** **(16)**

a) Describe various imperfections of crystal.
b) Explain Binary Eutectoid system.
c) What is a solid solution? Describe it's types.
d) What is stainless steel? Give it's applications.
e) Explain different effect of alloying elements in Fe-C diagram.
f) Explain Hume Rotnery's rules.

Q.3 Attempt any **FOUR** **(16)**

a) Explain Peritectic reaction.
b) Describe mechanism of crystallization.
c) Draw & label Fe-Fe_3C phase diagram.
d) Define & explain Lever Arm principle.
e) Explain the allotropic transformation of pure iron.
f) Explain composition and properties of tool steel H.S.S.

Q.4 Attempt any **FOUR** **(08)**

a) Which diagram gives the isothermal transformation of austenite?
b) Define heal treatment.
c) What is the purpose of tempering?
d) Enlist four properties of aluminium.
e) What are bearing alloys?
f) Enlist two advantages of non-destructive tests.

P.T.O.

Q.5 Attempt any **FOUR** **(16)**

a) Draw TTT diagram for eutectoid steel.

b) Explain the transformation of austenite to various other microstructures.

c) What is critical cooling rate? Explain the various cooling rates and microstructures obtained for iron.

d) Explain the the properties of copper. And explain the various copper alloys.

e) Explain the advantages of Nickel and cobalt alloys.

f) Why non-ferrous alloys are used in engineering? Classify various non-ferrous alloys.

Q.6 Attempt any **TWO** **(16)**

a) How the hardness of steel can be increased? Why after hardening tempering is done?

b) Explain the induction hardening and flame hardening. Give advantages and limitations.

c) Explain the non-destructive tests (any two)
i)Magna – flux test ii) Ultrasonic test iii) Penetrant test.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIFTH** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE:**MEE510/ME411/M411**

OURSE NAME: **INDUSTRIAL HYDRAULICS & PNEUMATICS**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **04/05/2016**

Instruction:-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I **Marks**

Q.1 Attempt any **FOUR** **(08)**

a) What are the functions of Hydraulic fluid.
b) What are the merits and limitations of Hydraulic system.
c) What do you mean by positive displacement pump?
d) Draw symbols of flow control valve and check valve.
e) What are the different pipe materials used in Hydraulic systems.
f) Classify Hydraulic actuators.

Q.2 Attempt any **FOUR** **(16)**

a) State applications of Hydraulic system.
b) Explain with neat sketch vane pump.
c) Explain with neat sketch pressure compensated flow control valve.
d) Explain with neat sketch construction of single acting cylinder.
e) Explain with neat sketch Diaphragm type Accumulator.
f) Draw neat sketch of Hydraulic circuit for milling machine.

Q.3 Attempt any **FOUR** **(16)**

a) Draw neat sketch of meter in circuit.
b) What are the different types of seals. Sketch any one type of seal.
c) Sketch any one type of Rotary actuator and explain its working.
d) Explain with neat sketch working 3/2 sliding spool type D.C.valve.
e) Explain straight axis piston pump with neat sketch.
f) Draw neat sketch of travel dependant sequencing circuit.

Section – II **Marks**

Q.4 Attempt any **FOUR** **(08)**

a) Give the classification of flow control valve in pneumatic system.
b) What is the function of shuttle valve.
c) Give the classification of Direction control valve.
d) What is the difference between Rotary actuator & linear actuator.
e) What is telescopic cylinder.
f) Give the merits & limitations of the pneumatic systems.

P.T.O.

Q.5 Attempt any **TWO** **(16)**

a) Explain with neat sketch working of directly operated pressure reducing valve.

b) Explain with neat sketch sequencing of single acting cylinder & Double acting cylinder using roller operated Direction control valve.

c) Give the classification of air motors & explain any one of it.

Q.6 Attempt any **TWO** **(16)**

a) Draw pneumatic circuit to operate double acting cylinder using two 3/2 spring return DCV. No other DCV should be used in the circuit. Explain in brief & state the application of this circuit.

b) Give the classification of filters used in pneumatic system. Explain any one of them.

c) Explain in brief of all components of pneumatic system. What are the factors to be considered while selecting them?

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIRST** PROGRAM: **CE/ME/SM/MT**

COURSE CODE: **CCE103/X103/X109/R105/R106** COURSE NAME: **ENGINEERING CHEMISTRY**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **28/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** **(08)**

a) Why inert gases are monoatomic in nature?

b) Write the orbital electronic configuration of ${}_{7}N^{14}$, ${}_{16}S^{32}$

c) Define i) Degree of ionization ii) Electro refining.

d) Define corrosion mention two types of corrosion.

e) Distinguish between hard water & soft water (any two points)

f) Define p^H. What is the p^H of extremely acidic & extremely alkaline solution?

Q.2 Attempt any **FOUR** **(16)**

a) Give the four assumptions of Bohr's Atomic theory.

b) Distinguish between electrovalent & covalent compound.

c) Describe the process of silver plating on iron spoon.

d) State and explain the type of impurities present in natural water. Name the process for the removal of these impurities.

e) Explain the disadvantages of hard water in cooking & washing use.

f) State & explain four causes of scale formation in boiler.

Q.3 Attempt any **FOUR** **(16)**

a) When same amount of current was passed through the solution of copper sulphate & zinc sulphate 0.7gm & 0.7164gm of copper & zinc get deposited on cathodes. If atomic weight of copper is 63.5. Calculated equivalent weight of Zn.

b) Describe electrolysis of $CuSo_4$ solution by using copper electrode.

c) Name & explain the method used for coating on large & irregular shape of articles for prevention of corrosion.

d) Define atmospheric corrosion. Explain two factors affecting atmospheric corrosion.

e) Draw the diagram. Give two chemical reactions in regeneration of ion exchange process.

f) Define sterilization of water. Explain with reactions use of bleaching powder.

Q.4 Attempt any **FOUR** **(08)**

a) Name the products of blast furnace. Give the composition of one product.

b) What is flash point and fire point of a lubricant?

c) Give two properties and two uses of glass wool.

d) What is vulcanization of rubber?

e) What are composite materials? Give its types.

f) Give the chemical composition of Portland cement.

Q.5 Attempt any **FOUR** **(16)**

a) What is nonferrous alloy? Give the composition, properties and uses of a) Duralumin b) Monel metal.

b) Give the reactions in heat absorption zone of blast furnace.

c) Name and explain the lubrication used for delicate machine parts.

d) Define paint. Give the functions of paints.

e) Give the reactions of setting and Hardening of cement.

f) Give four properties and uses of rubber.

Q.6 Attempt any **FOUR** **(16)**

a) Give the difference between calcinations and Roasting process.

b) What is ferrous alloy? Give the composition, properties and uses of i) Heat resisting steel ii) Magnetic steel.

c) Define lubricant. What are the functions of lubricant?

d) Name the drying oil and thinner added in paint. Give its functions.

e) What is thermocole? Give the properties and uses of thermocole.

f) What us addition polymerisation? Explain with examples.

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GOVERNMENT POLYTECHNIC, KOLHAPUR – 416004.

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FIFTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE509/ME410**

COURSE NAME :- **AUTOMOBILE ENGINEERING**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **27 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **FOUR** (08)

a) Define the term 'automobile'. List various types of automobiltes.

b) Write any two functions of clutch.

c) Write any two advantages and disadvantages of pneumatic brakes.

d) Draw a neat sketch of propeller shaft and label its parts.

e) Write any two requirements of steering system.

f) List various types of Gear Box.

Q.2 Attempt any **FOUR** (16)

a) Write various types of Vehicle Body. Write the condtions that must be fulfilled by vehicle body.

b) Differentiate between coil spring and diaphram spring type clutch.

c) With neat sketch, explain the working of rack and pinion type gear box.

d) Explain the working of differential with neat skech.

e) With neat sketch explain construction and working of pneumatic braking system.

f) Define the following terms with neat sketch.
i) Camber ii) Caster iii) Kingpin inclination iv) Toe-in and Toe-out.

Q.3 Attempt any **FOUR** (16)

a) Give classification of automobiles.

b) With neat sketch explain working of overdrive.

c) What is clutch? Write its necesity in automobile transmission system.

d) List various types of rear axles. Explain with neat sketch any one type of rear axle.

e) Compare disc brake with drum brake.

f) Explain with neat sketch working of power steering.

P.T.O.

Section – II	Marks

Q.4 Attempt any **FOUR** (08)

a) Draw the Leaf spring and Lable the figure.

b) State application Mc-pherson independent suspension system.

c) What is balancing of wheel?

d) Draw diagram of cross ply tyre.

e) Write the specification of battery.

f) What is color code in wiring system?

Q.5 Attempt any **FOUR** (16)

a) Give classifiction of suspension system with application

b) Explain torsion bar for rear suspension.

c) Explain working of air suspension system with neat sketch.

d) Compare radial ply and crossply tyre.

e) Explain the procedure for wheel alignment.

f) Differentiate between tubed tyre and tube less tyre.

Q.6 Attempt any **FOUR** (16)

a) Draw CDI ignition system and explain.

b) Draw construction and working of starter motor.

c) Explain charging system used in alternator.

d) How micro processor help in automobile to control different parameter.

e) Draw circuit diagram for Tail and indicator lighting.

f) How colour coding and Harnesing is done in wiring system?

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FIFTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE508/ME409**

COURSE NAME :- **REFRIGERATION AND AIR CONDITIONING**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **27 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **FOUR** (08)

a) List different methods of nonconventional refrigeration.
b) What is heat pump? Give its COP.
c) What are the advantages of Bell-Coleman cycle?
d) What is refrigerant? Give its classification.
e) Classify the compressors used in refrigeration system.
f) What is function of relay?

Q.2 Attempt any **FOUR** (16)

a) Draw a neat labed sketch of pulse tube refrigeration.
b) State need of refrigeration and write four major application of refrigeration.
c) A capacity of refrigerator is 300 tones when working between -4^0C and 15^0C. Determine the mass of ice producted per day at 0^0C from water at 15^0C. Assuming that the cycle operates on reverse Carnot cycle and latent heat of ice is 335 KJ/kg Cp of water is 4.187KJ/kg.
d) Explain why wet compression is not desirable in reciprocating compressor.
e) Differentiate between primary and secondary refrigerants.
f) Distinguish between open type compressor and hermetically sealed compressor.

Q.3 Attempt any **FOUR** (16)

a) What are the advantages and disadvantages of solar refrigeration system?
b) 1.5 KW work is required for one ton of refrigeration to maintain the temperature of -40^0C in the refrigeration cycle working on Carnot cycle. Determine i) COP of cycle ii) temperature of sink iii) Heat rejected per ton of refrigeration.
c) Show vapour compression refrigeration cycle with subcooling and superheating on P-V and T-S diagram.
d) Classify evaporaters used in refrigeraton.
e) What is the function expansion devices in refrigeration system? Explain any one with neat sketch.
f) What are the selection criteria for the equipments used in domestic refrigerator?

P.T.O.

	Section – II	Marks

Q.4 Attempt any **FOUR** (08)

a) State Dalton's law of partial presure.

b) State the factors affecting human comfort.

c) State the components of cooling load.

d) State any four applications of air conditioning.

e) Enlist air distribution outlets.

f) State the purpose of insulation.

Q.5 Attempt any **FOUR** (16)

a) Draw psychrometric chart and show all properties on it.

b) Obtain an equation for bypass factor for heating coil.

c) State factors affecting sensible heat gain.

d) State the classification of air-conditioning systems.

e) Draw a neat sketch of extended plenum system and explain its working.

f) State any four properties of good insulating material

Q.6 Attempt any **FOUR** (16)

a) Atmospheric air with dry bulb temperature of 28^0C and wet bulb temperature of 17^0C is cooled to 15^0C without changing its moisture content. Calculate i) Change in relative humidity. ii) Final wet bulb temperature.

b) Define air conditioning and state its necessity.

c) Distinguish between industrial and comfort air conditioning.

d) Enlist eight factors affecting thermal comfort.

e) Draw a neat sketch of winter air conditioning system and name the parts.

f) Distinguish between central and unitary air conditioning system.

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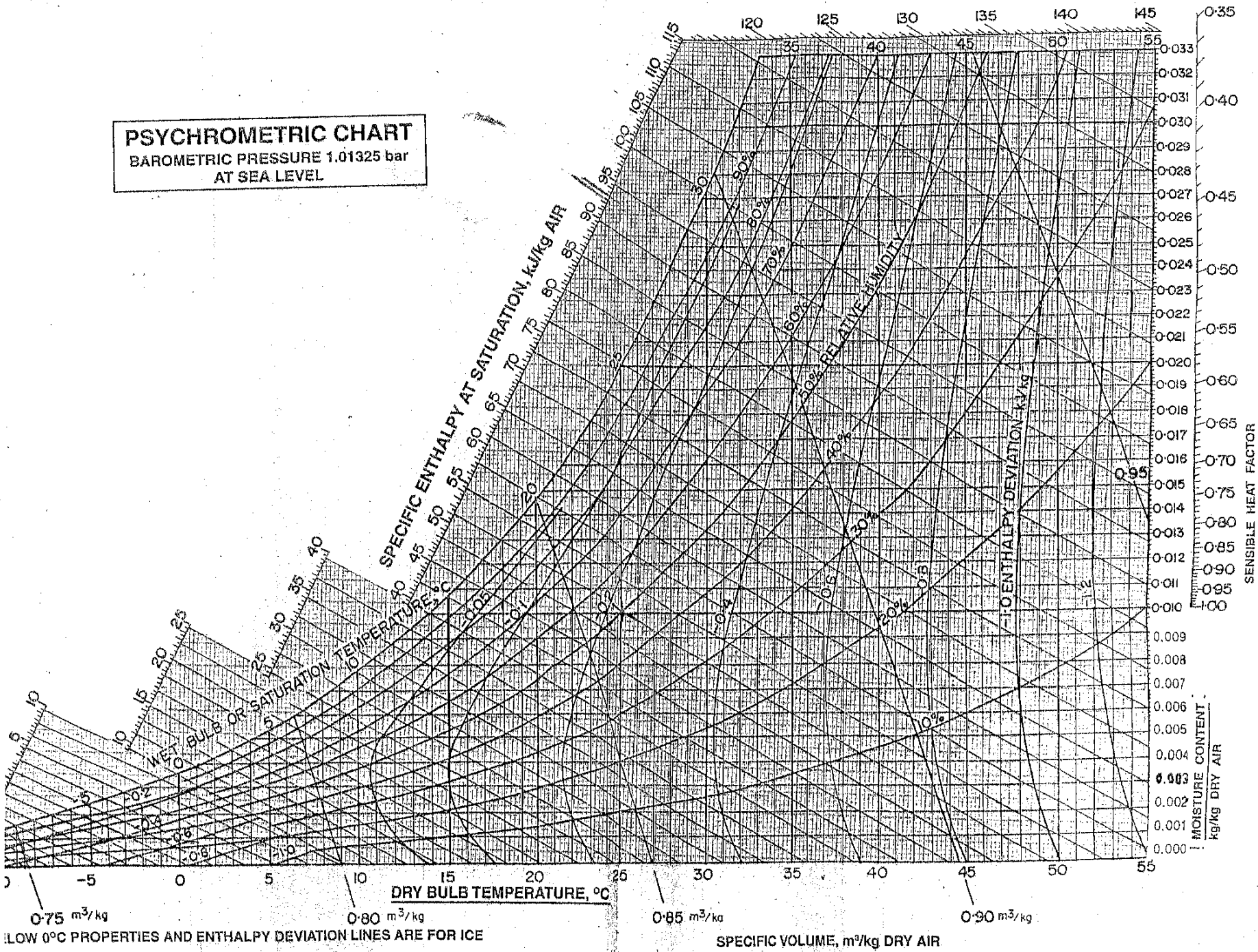
PSYCHROMETRIC CHART
BAROMETRIC PRESSURE 1.01325 bar
AT SEA LEVEL
SPECIFIC ENTHALPY AT SATURATION, kJ/kg AIR
WET BULB OR SATURATION TEMPERATURE, °C
DRY BULB TEMPERATURE, °C
ENTHALPY DEVIATION kJ/kg
MOISTURE CONTENT kg/kg DRY AIR
SENSIBLE HEAT FACTOR
SPECIFIC VOLUME, m³/kg DRY AIR
0·75 m³/kg
0·80 m³/kg
0·85 m³/kg
0·90 m³/kg
BELOW 0°C PROPERTIES AND ENTHALPY DEVIATION LINES ARE FOR ICE

GOVERNMENT POLYTECHNIC, KOLHAPUR – 416004.
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EVEN TERM END EXAM APRIL/MAY -2016
EXAM SEAT NO. | | | | | | |

LEVEL : - **FIRST** PROGRAM : **COMMON**
COURSE CODE :- **CCE110/X111/R112/0116**
COURSE NAME :- **APPLIED MECHANICS**
MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **26 / 04 / 2016**

Instruction :-
1) Answers must be written in the main answer book provided.(and supplements if required)
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** (08)

a) Define equilibrium and state the relation between resultant force and equilibrant force.
b) State principle of Transmissibility.
c) Define Resolution of force.
d) State graphical conditions of equilibrium for parallel force system.
e) Define angle of repose.
f) If angle of repose is 30^0, calculate coefficient of friction.

Q.2 Attempt any **FOUR** (16)

a) A force of 100KN makes an angle of 135^0 with the horizontal. Find its orthogonal components.
b) Calculate the total moment about point 'A' for the force system shown in fig.
c) Find resultant force of concurrent force system graphically.
d) Find support reaction of a given beam as shown in figure by analytical method.
e) A body resting on a rough horizontal plane is on the point of moving by a pull of 22N acting 30^0 inclined to horizontal. Find the weight of body and coefficient of friction.
f) A body of weight 400N is placed on plane inclined at an angle of 18^0 with the horizontal. If $\mu = 0.27$, find the value of the force to be applied parallel to the plane just to move the body up the plane.

Q.3 Attempt any **FOUR** (16)

a) Two point loads are acting on beam as shown in fig. The self weight of beam is 2 KN/m. Using graphical method. Find support reactions.
b) A sphere of diameter 1.2m and weighing 1800N rest against two smooth planes inclined at 60^0 and 45^0 respectively. Determine reactions offered by the planes.
c) Determine analytically, the resultant of coplanar parallel forces acting vertically upwards. 40N, 20N at 30mm, 30N of 50mm and 60N at 70mm. All distances are taken from first force towards right.

PTO

d) Four forces 20N, 15N, 30N and 25N are acting at 0^0,60^0,90^0 and 150^0 from X-axis taken in order. Find resultant by analytical method.

e) Two concurrent forces of magnitude 100N have their resultant as 100N. Calculate the angle between the forces.

f) Explain Law of frictions.

Q.4 Attempt any **FOUR** (08)

a) Define centriod of plain figure.
b) State or locate the centre of semicircle and semisphere.
c) State law of conservation of momentum.
d) State Newton's 1st law of motion.
e) State equation for angular motion and given meaning of each term.
f) Define power and its S.I. unit

Q.5 Attempt any **FOUR** (16)

a) Find the centre of gravity of an equal angle section 100 X 100 X10mm and locate on figure.

b) Find the centriod of shaded area as shown figure.

c) A body falling freely under gravity passes two points 9m aparts vertically in 0.2sec. Find from what height above the upper point did it start to fall?

d) A bullet weighing 3N leaves the barrel of a rifle with a muzzle velocity of 750m/s. If the length of parallel is 100cm. Find the impulse and impulsive force.

e) A particle is rotating at 300 RPM. If the radius of rotation is 1.5m calculate i) angular Velocity ii) Linear velocity.

f) The shaft of an electric motor rotates at 1500 rpm at a particular instant. In 8 second the speed uniformly decreases to 500 rpm. Find the angular retardation.

Q.6 Attempt any **FOUR** (16)

a) How many litres of water can be raised in 10 minutes to a height of 30m by means of pump of 2.5KW power and efficiency 80%?

b) Water having volume of 1500 liters is lifted to a height of 6m and is delivered at velocity of 4m/sec. What is the energy possessed by water?

c) A machine having following observation. Find the law of machine.

Load (N)	100	200	300	400	500	600
Effort (N)	10	18	25	28	33	39

d) For a lifting M/C UR=50.6. An effort of 90N lifts load of 1800N and an effort of 135N requires a load of 3150N. Determine law of M/C and Maximum efficiency of machine.

e) Define i) Mechanical Advantages ii) Velocity Ratio
iii) Efficiency iv) Reversible machine.

f) Draw the nature of graphs for a lifting machine.
i) Load Vs effort ii) Load Vs idea effort. iii) Load Vs Mechanical Advantage
iv) Load Vs effort lost in friction.

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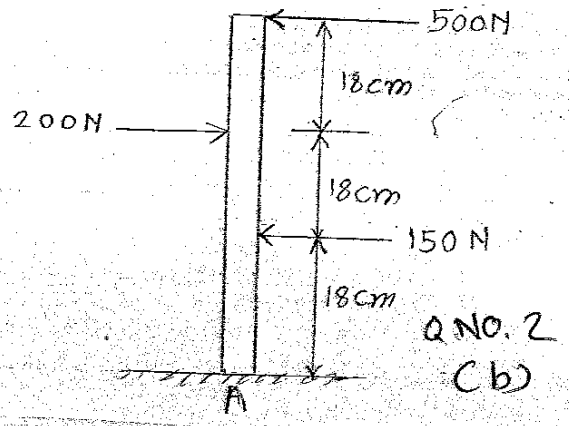

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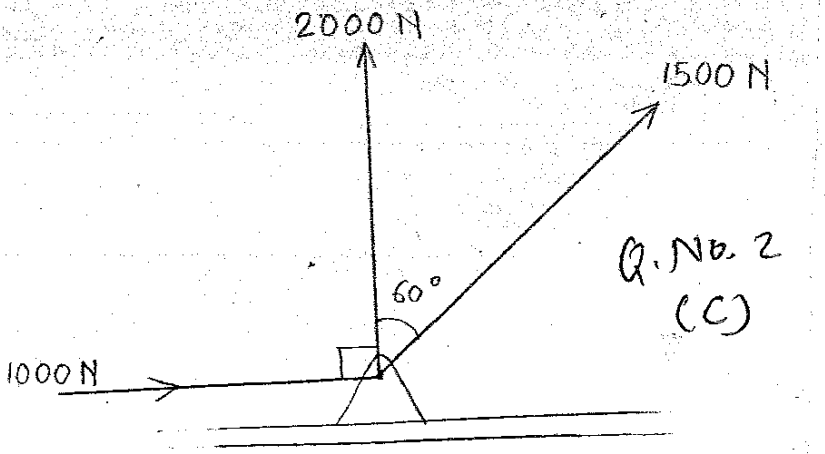
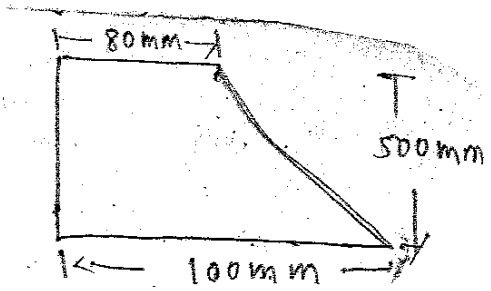


Q. No. 2 (c)



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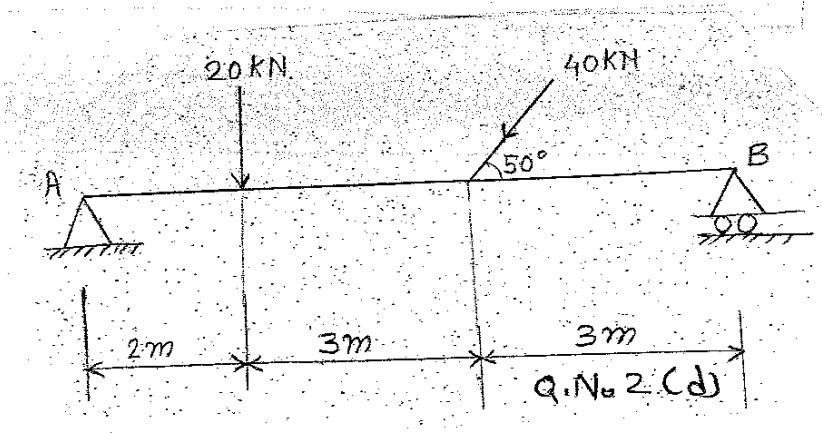
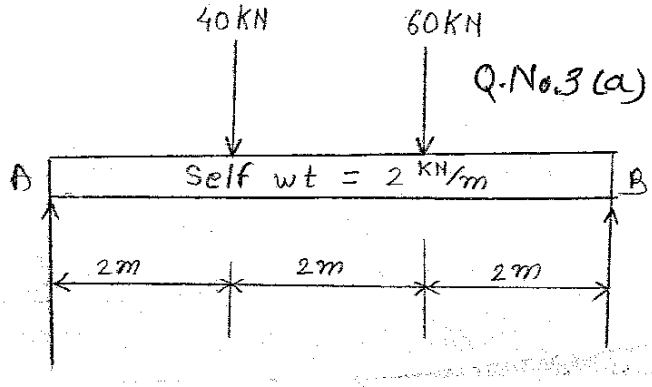


Q. No. 2 (d)



Q. No. 3 (a)

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FOURTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE411**

COURSE NAME :- **MARKETIG MANAGEMENT**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **26 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **FOUR** (08)

a) Why marketing management is important in today world?

b) What are the features of product, considered in the process of marketing?

c) Define marketing organization.

d) What is environmental scanning with respect to marketing?

e) Give characteristics of good market segmentation.

f) How market size is defined?

Q.2 Attempt any **FOUR** (16)

a) Explain scope of marketing.

b) Enlist various marketing tasks.

c) Explain various types of marketing organizations.

d) Explain good customer service characteristics with example.

e) Discuss the various careers in marketing.

f) Enlist various duties and responsibilities of a marketing supervisor.

Q.3 Attempt any **TWO** (16)

a) Describe the environmental scanning for automobile sector.

b) Classify marketing research and explain.

c) i) Explain various financial markets.

ii) Describe consumer market segmentation.

P.T.O.

Section – II	Marks

Q.4 Attempt any **FOUR** (08)

a) What is marketing planning?

b) Why branding is necessary?

c) List four factors affecting buyer behavior.

d) Explain role of communication in changing consumer attitude

e) State the importance of sales analysis.

f) Why sales forecasting is necessary?

Q.5 Attempt any **FOUR** (16)

a) What are different strategies in Marketing? Explain one.

b) What are competitive strategies for analyzing competitors?

c) Why to indentify market segments?

d) How product life cycle affect marketing strategies?

e) How market control is planned for farm machinery?

f) Explain role of market share in marketing and steps to increase market share.

Q.6 Attempt any **FOUR** (16)

a) Explain how press reation promotes marketing?

b) List the advantages of consumer education.

c) What is role of stockholder in market promotion?

d) What is role of salesman is sales department?

e) Enlist steps involved in conducting survey of buyer views.

f) What is role of distributor in sales?

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OVERNMENT POLYTECHNIC, KOLHAPUR – 416004.

(An Autonomous Institute of Govt. Of Maharashtra)

EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FIFTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE502/ME403/M403/2403**

COURSE NAME :- **INDUSTRIAL ORGANIZATION & MANAGEMENT**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **25 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I Marks

Q.1 Attempt any **FOUR** (08)

a) Enlist any two objectives of management.

b) What are the various types of partners?

c) Enlist any four government undertakings.

d) Why co-ordination is important in management?

e) Explain the four effects of information technology on communication of industry.

f) Enlist four functions of personnel management.

Q.2 Attempt any **TWO** (16)

a) Enlist various levels of management and give the competencies required in them

b) Explain any eight principles of scientific management.

c) Explain the formation and working of joint stock companies.

Q.3 Attempt any **FOUR** (16)

a) What is departmentalization? What are its advantages?

b) Differentiate clearly between authority and responsibility.

c) Enlist four objectives of training and four advantages of training.

d) Classify various personal protective devices used in industry and give their applications.

e) Define housekeeping. Why it is required?

f) Explain various factors considered in the personnel policy.

P.T.O.

Section – II	Marks

Q.4 Attempt any **FOUR** (08)

a) State objectives of materials management.

b) List down different sources of finance.

c) What are different factors affecting requirement of working capital?

d) Define Adult and child in relation to the Factory Act.

e) What are the objectives of industrial Acts?

f) What is critical path in project management?

Q.5 Attempt any **FOUR** (16)

a) Explain how inventory control helps in cost control.

b) State and explain steps in purchase procedure.

c) What are the duties of materials manager?

d) Explain concept of supply chain management.

e) Differentiate between shares and debentures.

f) Describe various sources of finance.

Q.6 Attempt any **FOUR** (16)

a) Describe different methods to promote safety awareness amongst workers.

b) State different provisions under factory act.

c) Differentiate between P.E.R.T. and C.P.M.

d) Write a note on M.R.P.

e) What is lean manufacturing?

f) A small scale mechanical unit carries out six activities as indicated below.

Sr. No.	Activity	Period in Days
01	1-2	04
02	2-3	06
03	3-5	05
04	2-4	04
05	4-5	03
06	5-6	05

Draw the network diagrams. Calculate EST, LST, EFT, LFT and Floats. Mark critical path and find out total project duration.

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MEE

GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE:**MEE303/ME203/M203/2203** COURSE NAME: **MACHINE DRAWING**

MAX. MARKS: **80** TIME: **4 HRS.** DATE: **25/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Q.1 Draw conventional representation of any four of the following. **Marks (08)**

a) Petrol
b) Counter sunk
c) Gate valve
d) Ratchet and pinion
e) Bevel Gear
f) Spiral spring

Q.2 Attempt any **TWO** **(16)**

a) A vertical cylinder of 75 mm diameter is penetrated by another cylinder of 50 mm diameter the axis of which is parallel to both HP & VP. The two axes are 9 mm apart. Draw the projections of two cylinders showing curve of intersection. Assume suitable axis length for both the cylinders.

b) A cone with base diameter 70 mm and axis length 65 mm is kept on HP on it's base. It is penetrated by a horizontal cylinder of diameter 35 mm with it's axis parallel to VP and intersecting the axis of a cone at a distance of 20 mm above the base of a cone. Draw the projections of a solids showing curve of inter section.

c) Figure shows front view incomplete top view and auxiliary view of an object. Redraw the front view and complete top view.

Q.3 Attempt any **FOUR** **(16)**

a) The shaft has a size of $35^{-0.02}_{-0.04}$ and a hole has a size of $35^{-0.02}_{+0.00}$ find the allowances and determine fit between then.

b) State the meaning of machining symbol in figure Q.3 (b)

c) Represent the welding drawing of two shafts with equal diameter welded end to end by means of square butt weld with convex counter of site.

d) What is the meaning of symbol at 'X' and 'Y' of figure Q.3(d)

e) Explain with neat sketch types of fits.

f) Define tolerance, allowance, deviation, fit.

P.T.O.

Q.4 Fig.Q.4 shows detail drawings of pipe vice. Draw Assembly drawing of the same with convenient scale **(20)**

a) Sectional front view - 14
b) Top view - 06

Q.5 Fig.1 shows Assembly drawing of Non-Return valve. Draw detail drawings of the following with convenient scale. **(20)**

a) Body - 8
b) Cover - 4
c) Valve - 4
d) Valve seat - 4

OR

Q.5 Fig.2 shows assembly Drawing Oldhams coupling. Draw detail drawings of the following. **(20)**

a) Flange - 8
b) Centre block - 6
c) Keys - 3
d) Shaft - 3

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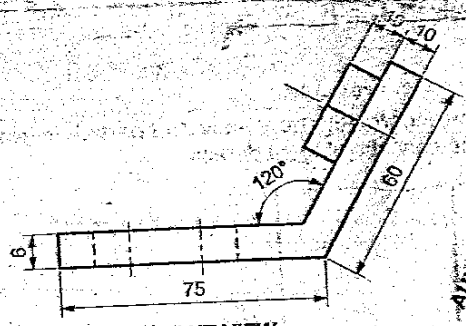
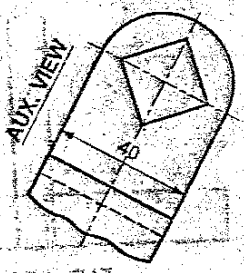
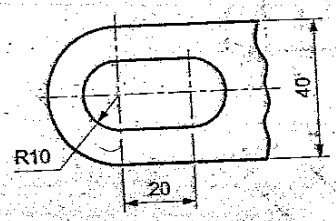
(01)

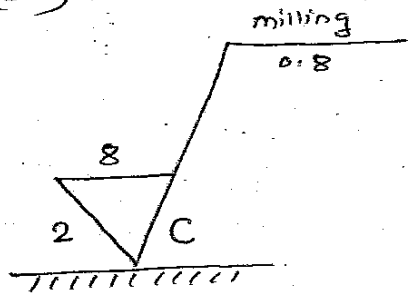




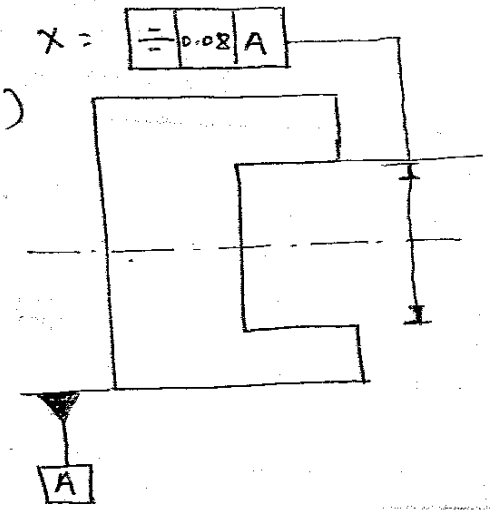


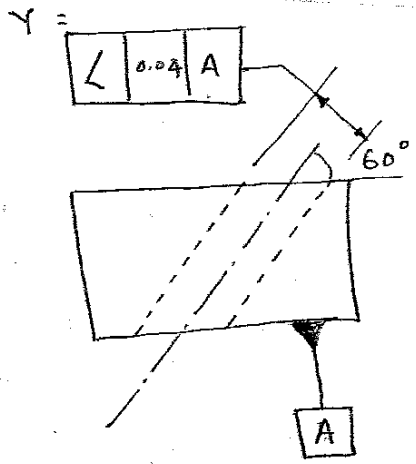
Q.2 (c).

Q3(b)



Q3(a)





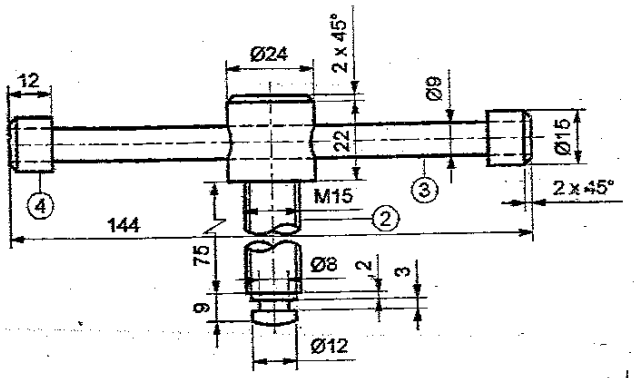
P.T.O.

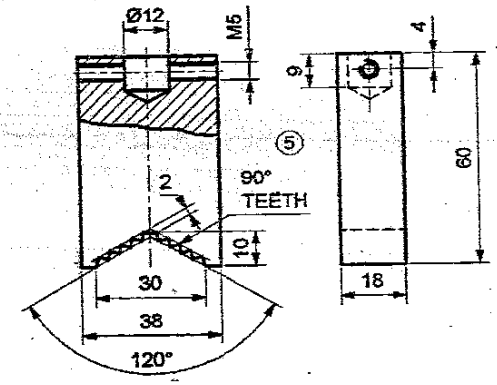
Pipe Vice :

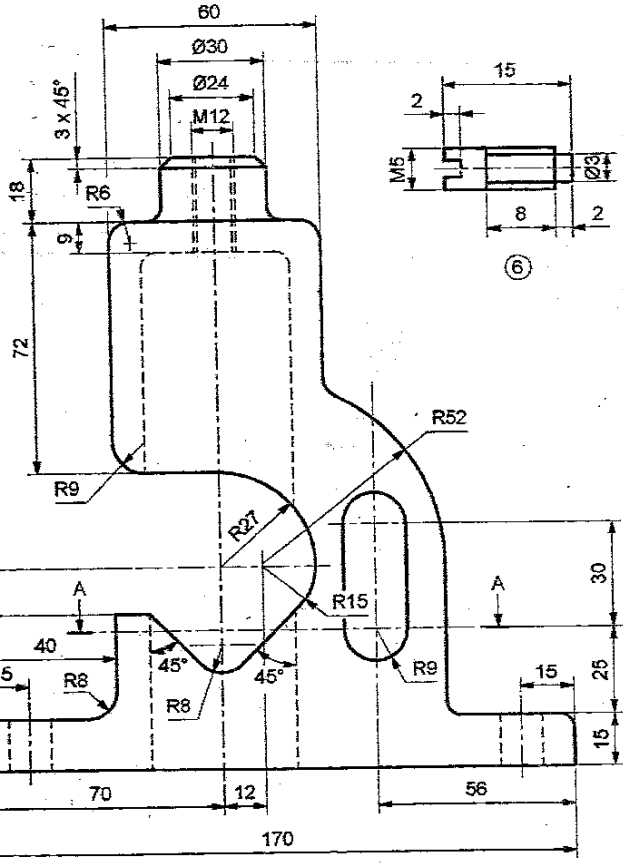
02

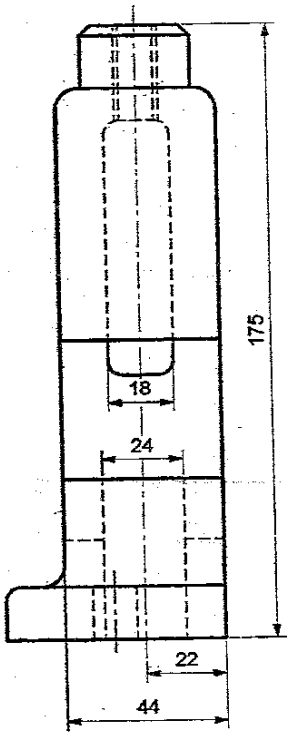
PART LIST

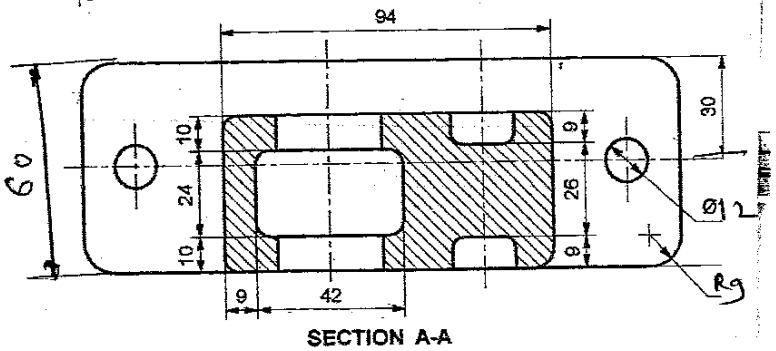
PART NO.	PART NAME	METL.	QTY.
1	HOUSING	C.I.	1
2	HANDLE SCREW	M.S.	1
3	HANDLE BAR	M.S.	1
4	HANDLE BAR BUSH	M.S.	2
5	JAW	C.I.	1
6	SET SCREW	M.S.	2









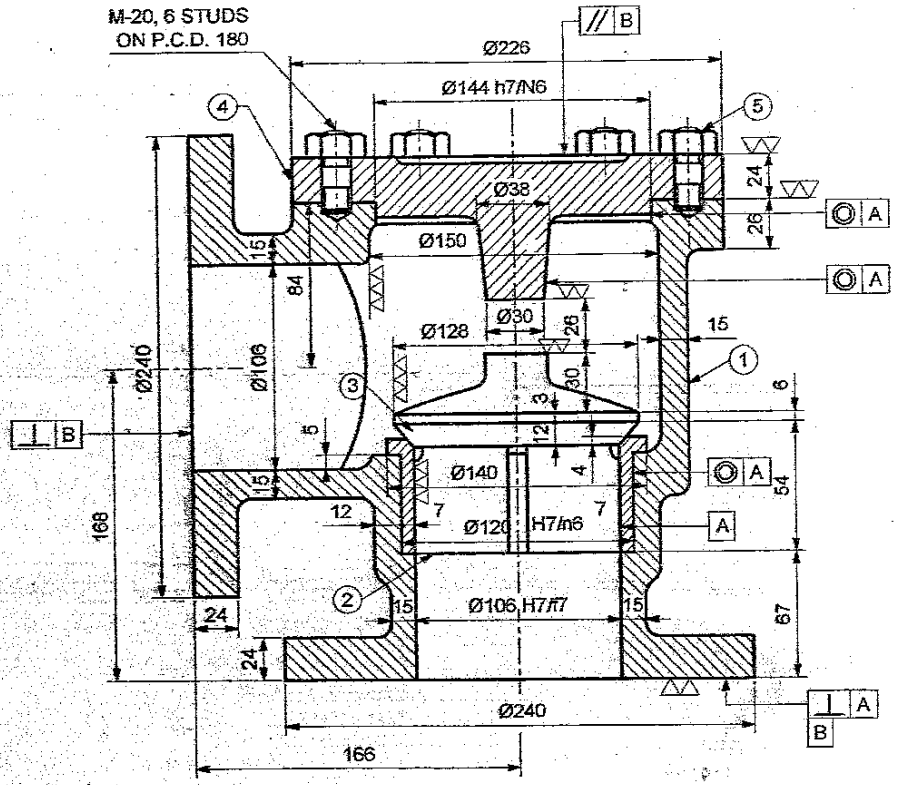


SECTION A-A

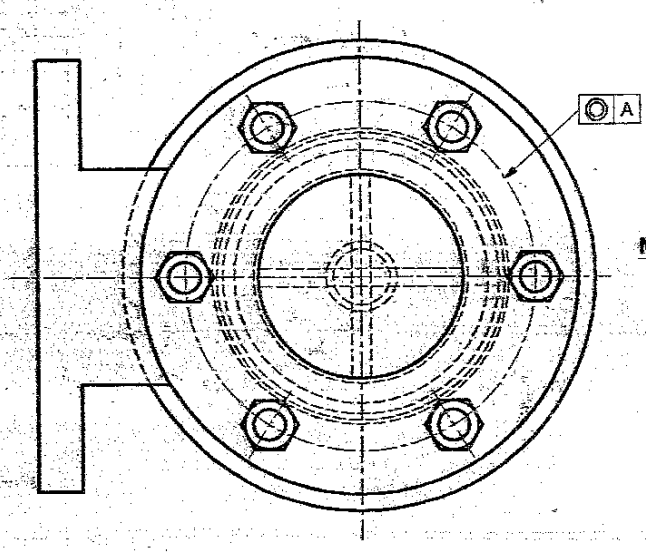
: Details of pipe vice

Q.4)

03



Q.5
fig 1



ASSEMBLY OF NON-RETURN VALVE

FIT CHART

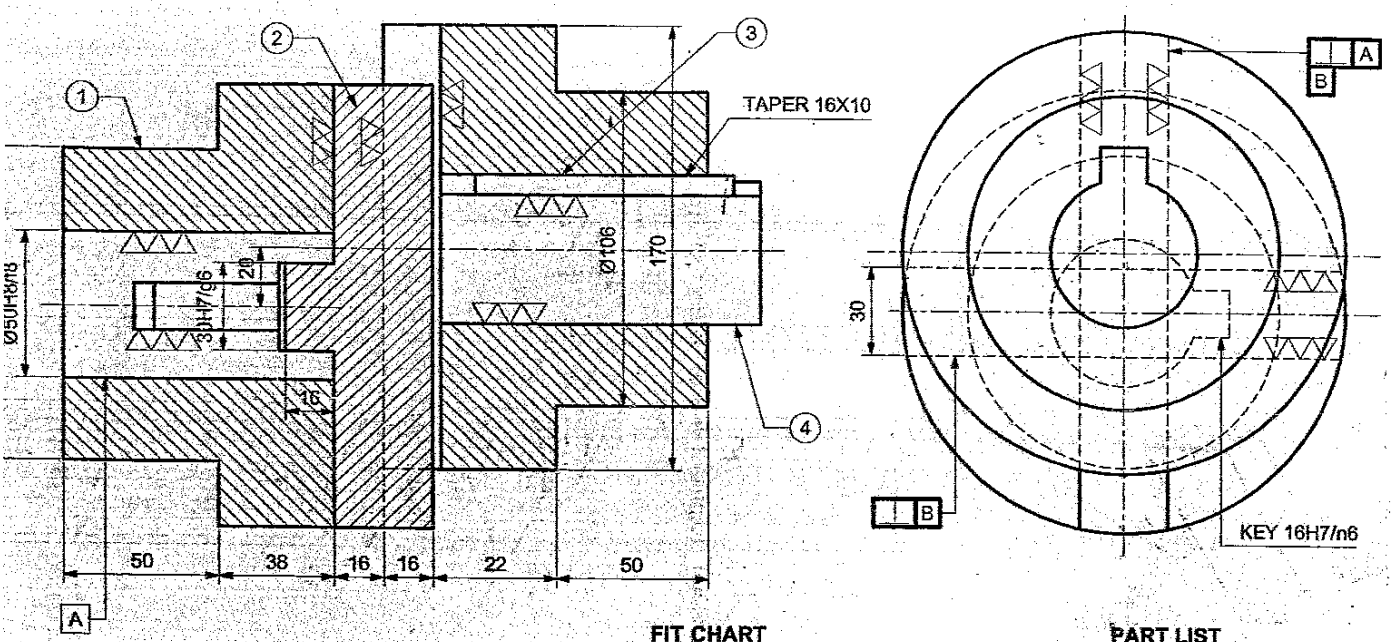
106H7/f7 = CLEARANCE FIT
144H7/h6 = CLEARANCE FIT
120H7/k6 = TANSINTION FIT

PART LIST

PART NO.	PART NAME	MATERIAL	QTY.
1	BODY	C.I.	1
2	VALVE SEAT	G.M.	1
3	VALVE	G.M.	1
4	COVER	C.I.	1
5	STUD WITH NUT	M.S.	4

P.T.O.

(04)



FIT CHART

16H7/n6	TRANSITION FIT
30H7/g6	CLEARANCE FIT
50H8/f8	CLEARANCE FIT

PART LIST

PART NO.	PART NAME	METL.	QTY.
1	FLANGE	C.I.	2
2	CENTER BLOCK	C.I.	1
3	KEYS	M.S.	2
4	SHAFT	M.S.	2

Q. 5. fig. (2)

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(An Autonomous Institute of Govt. Of Maharashtra)

EVEN TERM END EXAM APRIL/MAY. -2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **SECOND** PROGRAM : **COMMON**
COURSE CODE :- **CCE202/0101/0102**
COURSE NAME :- **COMMUNICATION SKILL**
MAX. MARKS : **40** TIME : **2 HRS.** DATE :- **06 / 05 / 2016**

Instruction :-
1) Answers must be written in the main answer book provided.(and supplements if required)
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** (Answer the following questions in 3-5 sentences) (08)

a) Draw a well labelled diagam illustrating the process of communication.

b) Enlist any four examples in which written communication is used.

c) Enlist four advantages of oral communication.

d) Explain two principles of effective written communication.

e) Define Haptics.

f) Enlist any four advantages of OHP.

Q.2 Attempt any **FOUR** (Answer the following question in 12-14 sentences) (16)

a) State i) Mechanical Barrier ii) Organizational Barriers.

b) Explain with sutiable example i)Upward communication.ii)Horizontal communication.

c) Enlist four tips for prepared speech.

d) State any four precautions one should take when making a presentation.

e) State and explain any four interview techniques.

f) State the guidelines on preparing presentation i) Thinking about audience ii) Good slide show design.

Q.3 Attempt any **TWO** (16)

a) Explain types of communication. i) Verbal- Non-verbal ii) Oral – Written.

b) Following is the opinion of 100 parents about the new pattern of board exam of students X. In this problem the data is given in %.

i) In favour of new pattern – 60 ii) Against new pattern – 30 iii) No comments -10

Prepare a pie-chart.

c) Write an application along with your resume to Modern Automobile Factory, Pune-8 for the post of Junior Engineer.

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL : FOURTH PROGRAM: MECHANICAL ENGINEERING

COURSE CODE : MEE410/ME309/M309

COURSE NAME : MECHANICAL MEASUREMENTS & MECHATRONICS

MAX. MARKS: 80 TIME: 3 HRS. DATE: 07/05/2016

Instruction:-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I **Marks**

Q.1 Attempt any **FOUR** **(08)**

a) State the basic difference between static characteristics and dynamic characteristics.
b) What do you understand by Fidelity of instrumentation system.
c) Draw block diagram of first order instrument and give two examples of it.
d) State the working principle of Thermocouple.
e) Draw neat sketch of Drag cup tachometer. State its principle.
f) State the working principle of turbine type flowmeter.

Q.2 Attempt any **FOUR** **(16)**

a) Write classification of instrument with basis, meaning and examples.
b) Draw block diagram of generalized measurement system. State the functions of important elements in it.
c) Explain hysteresis in measuring instrument.
d) Write the construction and working of optical pyrometer with neat sketch, in short.
e) Explain photo electric pick up tachometer with sketch.
f) Write the working of potentiometer, as a position measurement device, with sketch.

Q.3 Attempt any **FOUR** **(16)**

a) Explain Digital Optical Encoder with sketch.
b) Write the working of Pressure thermometer with sketch.
c) How ultrasonic flowmeter is operated for measuring flowrate?
d) Explain the construction and working of Absorption Hygrometer, to measure humidity.
e) Write the working and use of hydraulic dynometer.
f) Write the working of carbon microphone with sketch.

Section – II

Marks

Q.4 Attempt any **FOUR** **(08)**

a) What is microcontroller?
b) What is data acquisition?
c) Define actuator.
d) What is Bus?
e) List components uses for A to D conversion.
f) What is micro-stepping in stepper motor?

Q.5 Attempt any **FOUR** **(16)**

a) Compare Microprocessor and Microcontroller.
b) Explain variable frequency drives.
c) Write in brief about D to A conversion.
d) Draw pin diagram of 8051.
e) Explain solenoids.
f) Write selection of PLC.

Q.6 Attempt any **FOUR** **(16)**

a) Explain Reed relay.
b) Explain working of microcontroller.
c) Describe selection of motors.
d) Draw basic structure of PLC.
e) Explain Data loggers.
f) Explain Direction control valves.

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE: **MEE308/ME208/M208/2208**

COURSE NAME: **THEORY OF MACHINES & MECHANISM**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **07/05/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Q.1 Attempt any **FOUR** **Marks (08)**

a) What are different types of kinematic pairs according to the type of closure. Suggest one example for each.

b) What are the properties of Instantaneous centres.

c) Draw neat sketch of Paucellier mechanism.

d) Define cam & state how they are classified.

e) Why roller follower is preferred over knife edge follower.

f) What is the difference between Ackerman & Davis steering gear mechanism?

Q.2 Attempt any **TWO** **(16)**

a) i) Explain crank & slotted lever with neat labeled sketch.
ii) Enlist the inversions of double slider crank chain. Explain any one of them.

b) In a four bar chain PQRS, PS is fixed & is 150mm long, the crank PQ is 40 mm long & rotates at 120rpm clockwise while the link R S = 80 mm oscillates abouts QR & PS are of equal length. Find the angular velocity and angular acceleration of link RS when angle QPS = 60^0.

c) In a slider crank mechanism in figure below block P reciprocates along the fixed line AB & crank at the uniform speed of 200rpm for the given configuration Determine
i) Acceleration of P ii) Acceleration of point D

Q.3 Attempt any **TWO** **(16)**

a) A cam is to be designed for knife edge follower with following data.
i) Cam lift = 40 mm during 90^0 of cam rotation with simple harmonic motion.
ii) Dwell for the next 30^0.
iii) During the next 60^0 of cam rotation the follower returns to it's original position with simple harmonic motion.
iv) Dwell during the remaining 180^0, Draw the profile of cam when the line of stroke of the follower passes through the axis of the cam shaft. The radius of the base circle of the cam is 40mm.

b) i) Sketch & explain Grass hopper mechanism in detail.
ii) Describe Klien's construction to determine velocity & acceleration in single slider crank chain.

c) i) Explain different types of constrained motions with suitable sketches.
ii) Explain Beam Engine mechanism with a neat labeled sketch.

P.T.O.

Q.4 Attempt any **FOUR** **(08)**

a) Define slip & what happen to velocity ratio when slip is occur.
b) What is the function of clutch.
c) Write the advantages of gear drive over a flat belt drive.
d) What is the function of Governor.
e) Draw a neat sketch of Wilson-Hartnell Governor.
f) Define i) Addendum ii) Diametral pitch.

Q.5 Attempt any **FOUR** **(16)**

a) Derive the condition for transmitting the maximum power in flat belt drive.
b) Two parallel shafts whose centre lines are 4.8 m apart are connected by open belt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley 1m. The initial tension in the belt when stationary is 3 KN. The mass of the belt is 1.5 kg/m length. The coefficient of friction between the belt and the pulley is 0.3. Taking centrifugal tension into account calculate the power transmitted when the smaller pulley rotates at 400 rpm.
c) A spar gear having 40 teeth and diametral pitch of 0.3 mm. Find the pitch circle diameter, circular pitch and its module.
d) A certifugal clutch is to transmit 15kW at 900 rpm The shoe are four in number. The inside radius of the pulley rim is 150 mm and the centre of gravity of the shoe lies at 120mm from the centre of the spider. If the coefficient of friction is 0.25 determine mass of the shoes.
e) Explain with neat sketch Reverted gear train.
f) Explain the following terms related to the governor .
   - Height of Governor
   - Equilibrium speed
   - Radius of Rotation
   - Sleeve lift

Q.6 Attempt any **TWO** **(16)**

a) i) Explain what do you understand by Initial tension in belt.
   ii) A pulley is driven by a flat belt running at a speed of 600m/min. The coefficient of friction between the pulley and the belt is 0.3 and angle of lap is 160^0. If the maximum tension in the belt is 700N. Find power transmitted by the belt.
b) Derive expression for frictional torque for single plate clutch by using both uniform pressure and uniform wear theory.
c) i) Explain with neat sketch Pickering Governor.
   ii) Explain briefly the differences between simple, compound and epicydic gear trains.

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL**

COURSE CODE: **MEE307/ME207/M207** COURSE NAME: **APPLIED ELECTRONICS**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **09/05/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** **(08)**

a) Define semiconductor. State cut in voltage for Ge & Si material.

b) Draw symbol for NPN & PNP transistor.

c) Define i) Ripple factor ii) Efficiency of rectifier.

d) List any two applications of transistor.

e) Write the application of 78xx & 79xx series IC's.

f) State the types of MOSFET.

Q.2 Attempt any **FOUR** **(16)**

a) Draw & explain π filter.

b) Draw a neat labelled V-I characteristics of P-N junction diode & explain it.

c) Explain working of zener diode as a voltage regulator.

d) Explain working of switch mode power supply.

e) Draw & explain working of half wave rectifier with neat circuit diagram & waveforms.

f) Draw & explain output characteristics of common emitter configuration.

Q.3 Attempt any **TWO** **(16)**

a) Define line & load regulation. Draw block diagram of IC723 & explain it.

b) i) What is the need of filters? Give types of filters.

ii) Draw circuit diagram & waveforms of bridge rectifier & explain it.

c) i) Explain with neat circuit diagram working of single stage amplifier.

ii) List any four applications of MOSFET.

P.T.O

Q.4 Attempt any **FOUR** **(08)**

a) Draw symbol & truth table of AND gate.

b) $(215.95)_{10} = (?)_2$

c) $(1573)_{10} = (?)_{16}$

d) Draw a diagram of full adder.

e) Define encoder & decoder.

f) Give the truth table of SR flipflop & JK flipflop.

Q.5 Attempt any **FOUR** **(16)**

a) Solve the following

i) $(ABC.DE)_{16}=(\ )_2$

ii) $(263.32)_8=(\ )_{10}$

iii) $(11011.011)_2=(\ )_{10}$

iv) $(375)_{10}=(\ )_8$

b) Convert the following Boolean equation from standard SOP to standard POS form.

i) $Y=ABC+\bar{A}BC+\bar{A}\bar{B}C+A\bar{B}C+A\bar{B}\bar{C}$

ii) $Y=\bar{A}BC+A\bar{B}C+AB\bar{C}+ABC$

c) Implement following functions using k-map.

i) $F(A,B,C)=\Sigma\, m(0,1,2,3,)+d(4,5,7)$

ii) $F(A,B,C)=\Sigma\, m(0,2,4,6)$

d) Draw the circuit diagram & explain SISO shift register.

e) Compare counters & shift registers.

f) Explain MOD-7 counter with circuit diagram.

Q.6 Attempt any **FOUR** **(16)**

a) Explain block diagram of 8:1 multiplexer & give its truth table.

b) Draw a logical circuit diagram of 1:4 demultiplexer & give its truth table.

c) Draw the full substractor using two half substractor implement using logic gates & explain truth table of same.

d) Simplify following using Booleam Algebra

i) $Y=AB\bar{C}+\bar{A}\bar{B}\bar{C}+ABC+\bar{A}\bar{B}C+\bar{A}BC$

ii) $F=ABC+BC+A$

e) Give any four difference between SR & JK flipflop.

f) Draw a diagram & explain PIPO shift register.

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GOVERNMENT POLYTECHNIC, KOLHAPUR – 416004.

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FOURTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE403/ME303/M303**

COURSE NAME :- **ADVANCED MANUFACTURING PROCESSES**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **09 / 05 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **TWO** (08)

a) Sketch a vertical milling machine and label it.

b) Specify milling machines. State two applications of milling machine.

c) Differentiate between up milling and down milling.

Q.2 Attempt any **FOUR** (16)

a) Describe i) T slot milling ii) Slitting operation.

b) Define indexing. Describe the working of universal dividing head.

c) Index for 139 divisions.

d) Why gear finishing is carried out? Describe burnishing process.

e) Classify transfer machines. State their application.

f) Describe the pallet type transfer machine.

Q.3 Attempt any **FOUR** (16)

a) Describe hobbing process with a neat sketch.

b) Enlist product applications of EDM process.

c) Sketch on ECM set up. State the functions of an electrolyte.

d) List advantages and limitations of EBM process.

e) Define LASER. State its principle. State the limitations of LSM process.

f) Describe EDM process with sketch.

P.T.O.

Section – II Marks

Q.4 Attempt any **TWO** (08)

a) Describe objectives and benefits of TPM.

b) State the advantages and limitations of CNC machines.

c) Explain Feed function and Spindle Speed function with respect to NC words.

Q.5 Attempt any **FOUR** (16)

a) Draw the neat sketch of Horizontal Machining centre and label the parts. Describe principle parts of it.

b) What are the basic components of a numerical control system? Briefly discuss the function of each component.

c) With the help of suitable figure, describe axis identification for milling machine.

d) Identify the following codes with respect to CNC machines

i) G03 ii) G33 iii) G94 iv) M30

e) What is maintenance? What are the objectives of maintenance?

f) What is preventive maintenance? Prepare a maintenance record chart for a preventive maintenance of a machine tool.

Q.6 Attempt any **TWO** (16)

a) How will you classify CNC machines? Describe them in detail with the help of block diagrams.

b) What are the canned cycles? What are common canned/ fixed cycles for lathe operations? Explain a part programme of canned cycle for turning with suitable example.

c) What are the types of maintenance? Describe the objectives, advantages and disadvantages of Breakdown maintenance.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIFTH** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE: **MEE504/ME405/M405** COURSE NAME: **INDUSTRIAL ENGINEERING**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **10/05/2016**

Instruction:-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I **Marks**

Q.1 Attempt any **FOUR** **(08)**

a) What is production system?

b) What is plant layout?

c) Draw a labelled sketch for process layout.

d) List four powered equipments used for material handling.

e) What is cellular layout?

f) Classify different material handling equipment.

Q.2 Attempt any **FOUR** **(16)**

a) What are the factors affecting the site selection.

b) What are the characteristics of a Break even point?

c) How government policies affects the selection of plant layout?

d) What are symptoms of bad layout?

e) With a neat labeled sketch explain combination layout.

f) What do you understand by group technology? Justify your answer with the help of an example.

Q.3 Attempt any **FOUR** **(16)**

a) Define process planning explain four importance steps in process planning.

b) Define i) scrap factor ii) machine capacity.

c) List types of assemblyes and explain one.

P.T.O

d) What are the different function of production planning control?

e) List factors affecting scheduling.

f) Explain Gantt chart with a neat sketch.

Section – II **Marks**

Q.4 Attempt any **FOUR** **(08)**

a) What is 'JIT'

b) Define jig.

c) Define standard time.

d) Define Inventory.

e) What are equipment required for time study?

f) What is work measurement?

Q.5 Attempt any **FOUR** **(16)**

a) Explain Economic order quantity by graph.

b) Explain concept of six sigma.

c) What are objectives of work study?

d) Explain storage system for inventory.

e) Explain two handed process chart.

f) Write note on 'JIT'

Q.6 Attempt any **FOUR** **(16)**

a) What is difference between Jig and fixture?

b) What are different allowances for standard time calculation?

c) Explain concept of merit Rating.

d) What are General principals of Jig and fixture?

e) What are factors selecting for work study?

f) Write note on 5'S' as modern trend of manufacturing.

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EVEN TERM END EXAM APRIL/MAY. -2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **THIRD** PROGRAM : **MECHANICAL ENGINEERING**
COURSE CODE :- **MEE306 /ME206/M206**
COURSE NAME :- **MACHINE TOOLS**
MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **10 / 05 / 2016**

Instruction :-

1) Answers must be written in the main answer book provided.(and supplements if required)
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** (08)

a) Enlist four desirable characteristics of cutting fluids and coolants.

b) What is buit up edge?

c) What is the use of knurling operation?

d) Classify various types of lathes.

e) Explain reaming operation.

f) Classify various types of drills.

Q.2 Attempt any **FOUR** (16)

a) Explain single point cutting tool geometry with neat sketch. (three views)

b) What is tool signature? Give example.

c) Classify various types of chips and explain their formation.

d) Differentiate clearly between orthogonal and oblique cutting.

e) Explain the process of step turning with neat sketches.

f) Draw a light duty lathe and show basic parts on it.

Q.3 Attempt ay **TWO** (16)

a) Classify various operations performed on lathe and explain any four.

b) Explain following operations performed on drilling machine with simple sketch.

i) Trepanning ii) Spot facing iii) Counter boring iv) Counter sinking

c) Describe the various cutting parameters of drilling operation.

How the machining time is calculated?

P.T.O.

Q.4 Attempt any **TWO** (08)

a) Sketch a shaper and label it.

b) Describe the principal parts of a slotter.

c) How do you specify a planer?

Q.5 Attempt any **FOUR** (16)

a) Describe quick return mechanism of a shaping machine.

b) Sketch various grinding wheels with their application.

c) How will you designate a grinding wheel?

d) Classify grinding machines.

e) How you will select a grinding wheel?

f) Describe the principle of internal centreless grinder with sketch.

Q.6 Attempt any **FOUR** (16)

a) Describe lapping process with respect to a lap and lapping machines.

b) Define polishing and butting operation. Give one application of each type.

c) State the advantages and limitations of honing process.

d) Classify broaching machines. State two applications of broaching.

e) Sketch a broach and show various terms on it

f) Sketch a horizontal broaching machine and label it.

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIRST** PROGRAM: **ME/EE/SM**

COURSE CODE: **CCE108/X107/R110** COURSE NAME: **ENGINEERING DRAWING-II**

MAX. MARKS: **80** TIME: **4 HRS.** DATE: **12/05/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Draw any **two** proportionate free hand sketches of the following. **(08)**

a) Lewis foundation bolt

b) Single riveted lap joint

c) Sellers thread & buttress thread

Q.2 Attempt any **TWO** **(16)**

a) Fig.2.1 is an isometric view of an object. Draw the following views by using first angle method of orthographic projection.

i) Front view in the direction of arrow 'X' (04 Marks)

ii) Top view (04 Marks)

b) Refer Fig.No.2.2 and draw following views by using first angle method of orthographic projection.

i) Front view in the direction 'X' (04 Marks)

ii) Side view looking from left (04 Marks)

c) Fig.2.3 show pictorial view of an object. Draw the following views by using first angle method.

i) Front view in the direction 'X' (04 Marks)

ii) Top view (04 Marks)

Q.3 Attempt any **ONE** **(16)**

a) Draw the following views from the pictorial view shown fig.3.1

i) Sectional front view – section along A-A (06 Marks)

ii) Top view (05 Marks)

iii) Side view looking from left (05 Marks)

Use First angle method.

P.T.O

b) Fig.3.2 show pictorial view of an object. Draw the following views by using first angle method.

i) Front view in the direction 'X' (05 Marks)

ii) Top view (05 Marks)

iii) Sectional side view –section along A-A (06 Marks)

Q.4 Attempt the **Following** **(08)**

a) Fig.4.1 shows two views of an object. Draw its missing top view.

Q.5 Draw any one of the following **(16)**

A) i) Fig. 5.1 shows F.V & T.V. of an object. Draw isometric view. (14 Marks)

ii) Draw isometric scale for 100mm (02 Marks)

B) i) Fig.5.2 shows F.V & S.V of an object. Draw isometric view. (14 Marks)

ii) Draw isometric scale for 75mm (02 Marks)

Q.6 Attempt any **TWO** **(16)**

a) The elevation of a steel chimney 600mm in a diameter fitted to an inclined root is shown in fig.6.1. The axis of cylindrical chimney is 150mm from the ridge develop the lateral surface of the chimney (Use suitable scale) (08 Marks)

b) A hexagonal pyramid, base 30mm side & axis 75mm long is resting on H.P with side of base parallel to V.P it is cut by a section plane, perpendicular to the V.P & inclined at 45^0 to the H.P & bisecting the axis. Draw development of lateral surface. (08 Marks)

c) Draw the development of lateral surface of a pentagonal prism with edge of base 40mm & height 90mm, kept on the H.P on its base with an edge of base parallel to V.P when it is cut by AIP inclined at 30^0 to H.P & bisecting the axis of the prism. (08 Marks)

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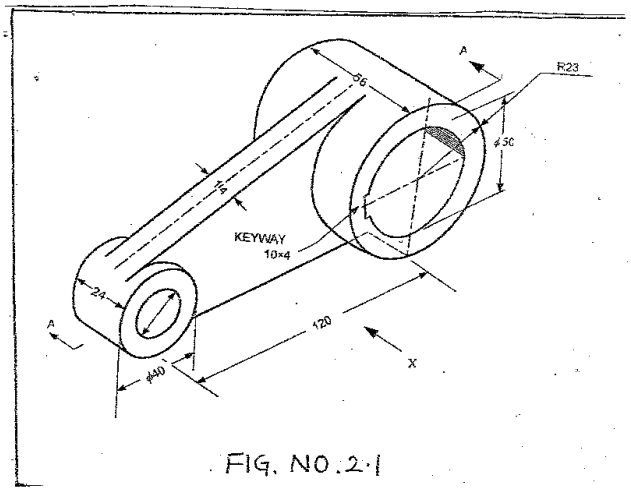

FIG. NO. 2·1

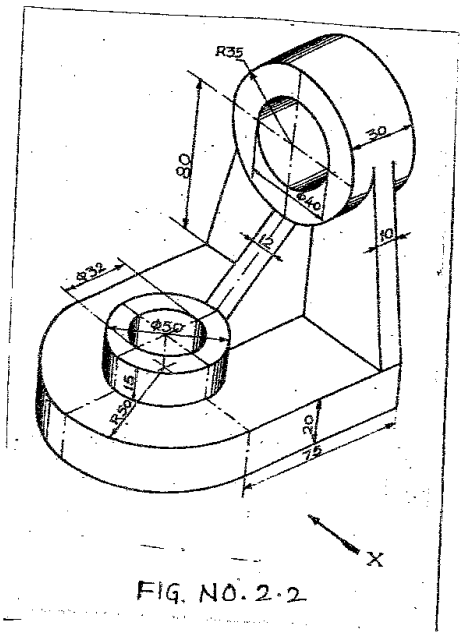

FIG. NO. 2·2

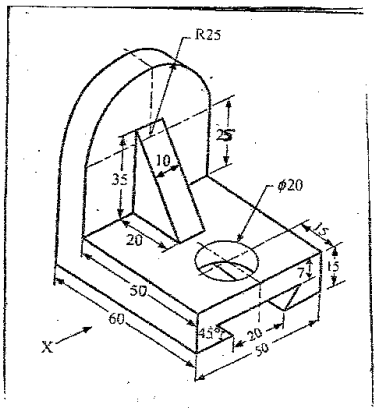

FIG. NO. 2·3

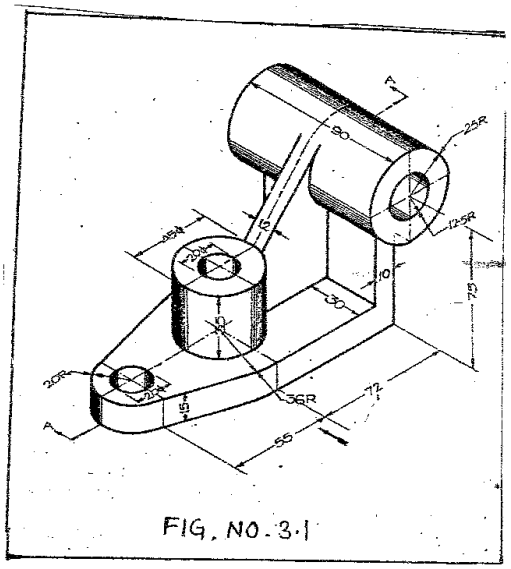

FIG. NO. 3·1

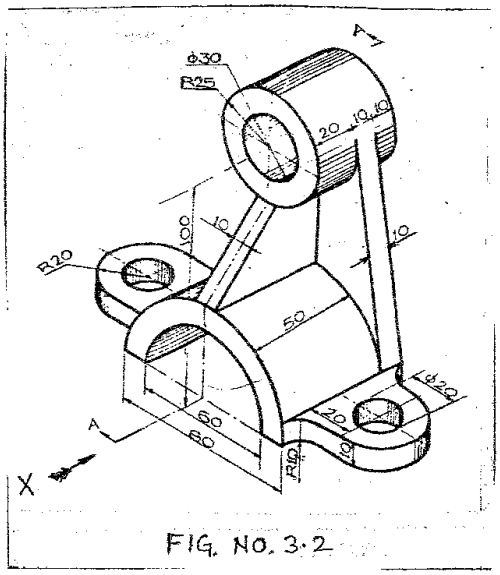

FIG. NO. 3·2

P.T.O.

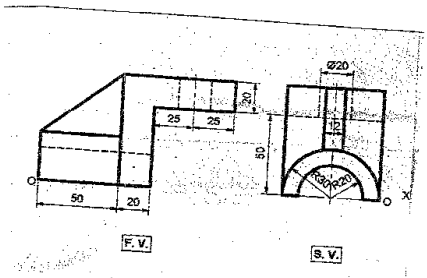

Fig. 4.1

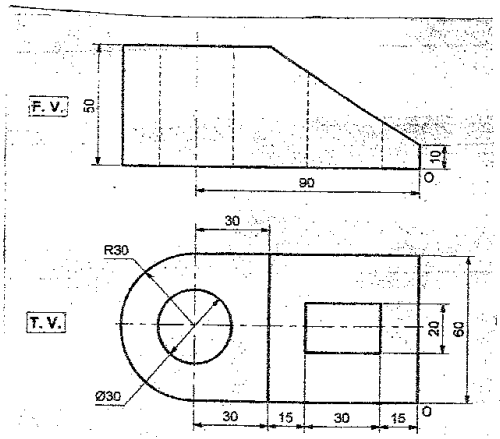

Fig. 5.1

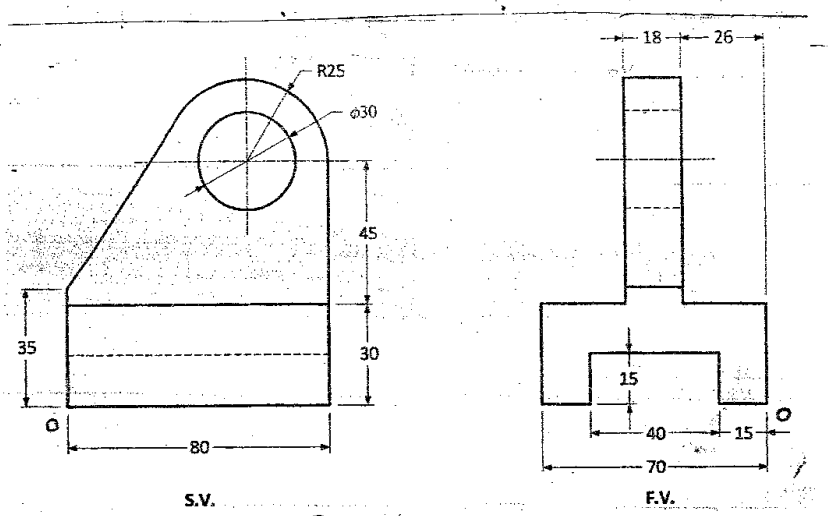

Fig. 5.2

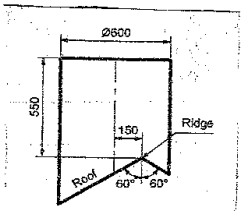

Fig. 6.1

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE: **MEE302/ME202/M202/2202** COURSE NAME: **THERMAL ENGEERING**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **12/05/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Q.1 Attempt any **FOUR** **Marks (08)**

a) Define conduction & give one example.

b) Define internal energy.

c) State the first law of thermodynamics.

d) Derive the unit of characteristic gas constant.

e) What is flow work?

f) State Newton's law of cooling.

Q.2 Attempt any **FOUR** **(16)**

a) Differentiate between heat & work.

b) Derive steady flow energy equation for condenser & turbine.

c) How heat exchangers are classified?

d) Explain the concept of heat engine.

e) Show the following processes on P-V & T-S diagram i) Isobaric ii) Adiabatic

f) Evaluate the heat transfer by conduction through a copper rod (K=300W/mK) of 20cm length & C/S area of $1cm^2$. One end of the rod is maintained at 160^0C, while the other end at 60^0C. The curved surface of the rod is insulated.

Q.3 Attempt any **TWO** **(16)**

a) Steam enters a turbine with a velocity of 16m/s & enthalpy 2990 KJ/kg. The steam leaves the turbine with a velocity of 37 m/s & enthalpy 2530 KJ/kg. The heat lost to the surrounding though turbine is 25KJ/kg. The steam flow rate is 324×10^3 kg/hr. Determine the work output from the turbine.

b) Define system classify it. Explain types with one example of each.

c) A gas whose pressure, volume & temperature are 275 KN/m^2, $0.09m^3$ & 185^0C, respectively, has its state change at constant pressure until its temperature become 15^0C. How much heat is transferred from the gas & how much work is done on the gas during the process?
Take R=0.29KJ/kg-K & C_P=1.005KJ/kg K

Q.4 Attempt any **FOUR** **(08)**

a) Explain sensible heat.

b) Define term latent heat.

c) What is the function of calorimeter?

d) Write any two boiler mountings and any two boiler accessories.

e) Which device is used for safety of boiler in case where temperature of steam inside boiler exceeds the maximum limits?

f) Why the steam nozzles used in steam turbine?

Q.5 Attempt any **FOUR** **(16)**

a) Explain dryness fraction and its value for wet steam, saturated steam and superheated steam.

b) Differentiate between fire tube boiler and water tube boiler.

c) Write classification of boiler (any four)

d) Write classification of steam turbine (any four)

e) What are the sources of air leakage in condenser and effects of air leakages in condenser?

f) Differentiate between Jet condenser and surface condenser on the basis of following

   a) Construction
   b) Performance
   c) Application
   d) Flow of steam & cooling water.

Q.6 Attempt any **FOUR** **(16)**

a) Draw T-S and H-S diagrams for steam generation process at constant pressure.

b) Determine the steam is wet or superheated and calculate its dryness fraction if the steam is wet or the superheated steam temperature for the following case P = 6 bar and h = 2600 KJ/kg (use steam table)

c) Explain with neat sketch the working of Lamont boiler.

d) Explain with neat sketch forced draft cooling tower.

e) Explain impulse turbine with neat sketch.

f) What is the use of reheat cycle in thermal power plant and also state its advantages.

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EVEN TERM END EXAM APRIL/MAY. -2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FIRST** PROGRAM : **MECHANICAL ENGINEERING**
COURSE CODE :- **MEE101**
COURSE NAME :- **FUNDAMENTALS OF MECHANICAL ENGG.**
MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **16 / 04 / 2016**

Instruction :-

1) Answers must be written in the main answer book provided.(and supplements if required)
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available o request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** (08)

a) Name various thermodynamic processes.

b) List components of I.C. engine.

c) Define i) Internal energy ii) flow work.

d) Draw P-V and T-S diagrams of otto cycle.

e) Define i) State ii) Process.

f) Define tonne of refrigeration.

Q.2 Attempt any **FOUR** (16)

a) Explain the first law of thermodynamics.

b) Write detail classification of I.C. engine.

c) Explain vapour compression system with neat sketch.

d) Explain construction and working of four stroke petrol engine.

e) Explain thermodynamic system. Also give its classification.

f) Give properties of refrigerant.

Q.3 Attempt any **FOUR** (16)

a) Write types of injection systems in I.C. engine.

b) Explain Zeroth law of thermodynamics.

c) Explain Battery Ignition system with neat sketch.

d) Explain Summer Air Conditioning system.

e) Explain air cooling in I.C. engine.

f) Compare Summer and Winter Air Conditioning systems.

P.T.O.

Q.4 Attempt any **FOUR** (08)

a) State the principle of working of hydraulic turbine.

b) Enlist different types of pulleys.

c) Define Renewable Energy Sources.

d) What is pump?

e) State the types of belt.

f) What is fuel cell?

Q.5 Attempt any **FOUR** (16)

a) How compressors are classified?

b) State the advantages & limitations of tidal plant.

c) Draw a neat sketch of coupling.

d) Why chain drive is preferred over belt drive?

e) Explain with neat sketch nuclear power plant.

f) Compare: Renewable & Non-renewable energy sources.

Q.6 Attempt any **TWO** (16)

a) Explain with neat sketch, construction & working of reciprocating compressor.

b) Explain with neat sketch construction and working of flat plate collector.

c) Explain with neat sketch construction and working of Francis turbine.

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL/SUGAR**

COURSE CODE: **MEE309/SM207/ ME209/M209/2209**

COURSE NAME: **ELETCRICAL TECHNOLOGY**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **18/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **FOUR** **(08)**

a) State the sailent feature of parallel resistance circuit.

b) State Ohms law.

c) State the applications of i) clip-ON meter ii) Digital multimeter.

d) Define impedance. State its unit.

e) What do you understand by balanced load?

f) State the line and phase relationship of voltage and current in a star connected load.

Q.2 Attempt any **FOUR** **(16)**

a) State and explain Kirchhoff's current law.

b) The resistance of an electric bulb when connected across 230V supply is measured as 1322.5Ω. Find the power rating of the bulb. If this bulb is connected for 6 hours. What will be cost of energy if the rate is Rs 5 per KWh.

c) Explain construction & working of megger.

d) Compare star connection with delta connection.

e) Explain faraday's laws of electromagnetic induction.

f) Define i) instantaneous value ii) average value iii) RMS value iv) peak value for ac sinusoidal waveform.

Q.3 Attempt any **FOUR** **(16)**

a) Explain pipe earthing with neat sketch.

b) Show that the equivalent resistance R_{eq} of the series circuit can be calculated by using the relation $R_{eq}=R_1+R_2+R_3+\text{-----}R_n$

c) State advantage of polyphase systems. State types of three phase supply system.

P.T.O

d) Explain purely inductive AC circuit with the help of circuit diagram, phasor diagram. State the instantaneous equations of current and voltage for this circuit.

e) Explain series R-C circuit with the help of circuit diagram, phasor diagram.

f) Define i) waveform ii) cycle iii) frequency iv) time for A.C sinusoidal waveform.

Q.4 Attempt any **FOUR** **(08)**

a) What is the function of transformer?

b) Define efficiency of transformer.

c) List out different advantages of electric heating.

d) List out different parts of D.C machines.

e) Define Torque of induction motor.

f) List out starters used for slip-ring induction motor.

Q.5 Attempt any **FOUR** **(16)**

a) Derive the e.m.f equation of transformer.

b) Compare ideal & practical Transformer.

c) With neat diagram explain the working of induction furnace.

d) With diagram explain resistance heating in detail.

e) Explain the working principle of stepper motor with diagram.

f) Explain the need of starters for squirrel cage induction motor.

Q.6 Attempt any **FOUR** **(16)**

a) Explain the different losses occur in single phase Transformer.

b) With block diagram explain dielectric heating in detail.

c) State illumination level for small workshop, drawing hall lecture hall & big workshop.

d) Give brief classification of D.C motors with their schematic representation.

e) Explain the method of starting by direct ON line for 3 phase induction motor.

f) List out the application of squirrel cage & slip ring induction motor.

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GOVERNMENT POLYTECHNIC, KOLHAPUR – 416004.

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FOURTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE407/ME307/M307/2308**

COURSE NAME :- **METROLOGY**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **20 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **FOUR** (08)

a) State the significance of legal metrology.
b) State any two advantages of wavelength standard.
c) What is comparator? State various types of mechanical comparators.
d) Define the terms i) Deviation ii) Tolerance.
e) State any four instruments used for angle measurement.
f) Draw a neat sketch of Universal Bevel protector and label it.

Q.2 Attempt any **FOUR** (16)

a) List the characteristics of measuring instrument (any eight)
b) Define error in measurement. List sources of error. (any Six)
c) Differentiate between precision and Accuracy.
d) Explain with sketch, multi gauging system.
e) An angle of $139^0\ 33'\ 30''$ is to be measured by standard set of angle gauges as $[1^0, 3^0, 9^0, 27^0, 41^0,]$ $[1', 3', 9', 27']$, $[3'', 6'', 18'' 30'']$ & square block, sketch the arrangement with minimum number of gauges.
f) Why sine bar is not preferred for measuring angle more than 45^0.

Q.3 Attempt any **FOUR** (16)

a) What is selective assembly?
b) State and explain Taylor's principle of gauge design.
c) Write advantages and disadvantages of pneumatic comparators.
d) State any six characteristics of Good Comparator.
e) Describe the working of Sigma Comparator with neat sketch.
f) Enlist the slip gauges to be wrung for an overall dimension of 71.568mm using a set of M45 with the protection slips of 1mm each on both sides.

Range	Step	Pieces
1.001 to 1.009	0.001	9
1.01 to 1.09	0.01	9
1.1 to 1.9	0.1	9
1 to 9	1	9
10 to 90	10	9
	Total	45

P.T.O.

Section – II	Marks

Q.4 Attempt any **FOUR** (08)

a) Write the causes of periodic pitch error.(any two)

b) Enlist different elements of screw thread.

c) Name the different elements of gear tooth which are measured for accuracy of gear.

d) Enlist sources of Error in manufacturing gears.

e) Why calibration of instrument is necessary?

f) Define Roundness. State methods for measurement of roundness.

Q.5 Attempt any **FOUR** (16)

a) What is progressive error? Write cause of progressive pitch error.

b) What is rolling gear test? Explain its principle with neat sketch.

c) With neat sketch explain the symbol for designating surface finish on Drawing.

d) Define the term i) Primary texture & ii) Secondary Texture related to surface.

e) Explain working principle of stylus probe type surface texture measuring instruments. List various types of stylus probe type instruments.

f) Write importance of calibration of measuring instruments.

Q.6 Attempt any **TWO** (16)

a) Explain with neat sketch measurement of tooth thickness by gear tooth vernier.

b) i) Draw a neat sketch of screw thread micrometer. State its principle of working.
ii) What is Drunken error? Explain it with neat sketch.

c) What is Lay? Draw and explain symbols used to indicate the direction of Lay with respect to surface finish.

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EVEN TERM END EXAM APRIL/MAY. -2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **THIRD** PROGRAM : **MECHANICAL ENGINEERING**
COURSE CODE :- **MEE304/ME204/M204/2204**
COURSE NAME :- **MANUFACTURING PROCESSES**
MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **20 / 04 / 2016**

Instruction :-

1) Answers must be written in the main answer book provided.(and supplements if required)
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Marks

Q.1 Attempt any **TWO** (08)

a) Explain the grain flow in forged parts. What is Foregeability?

b) What are the various patterns that are normally encountered in foundry practice? Explain the match plate pattern with neat sketch.

c) What are the properties of moulding sand? Explain any two of them.

Q.2 Attempt any **FOUR** (16)

a) What are the various die-casting techniques? Describe Hot Chamber Die Casting Method with neat sketch.

b) What are the different types of moulding sands? Describe them in brief.

c) State the advantages and disadvantages of Green Sand Mould.

d) Explain with neat sketch press forging.

e) What do you mean by Blow holes in casting? What are the causes & remedies of blow holes?

f) Describe the importance of Shrinkage and Rapping allowance during design of casting.

Q.3 Attempt any **TWO** (16)

a) Explain various Melting Furnaces used for Non-ferrous metals with neat sketches.

b) Differentiate between Dry sand Moulding and Green Sand Moulding . State the advantages and disadvantages of Shell Moulding.

c) Describe colour codes used for patterns and core boxes. Describe with neat sketch various types of core-prints.

P.T.O.

Q.4 Attempt any **TWO** (08)

a) Describe direct extrusion with its advantages.

b) Discuss about rolling mills.

c) Describe compression moulding with its advantages.

Q.5 Attempt any **FOUR** (16)

a) Sketch a die set. Label it. State functions of any two components used in it.

b) Describe submerged are welding method with its advantages.

c) List equipments of gas welding.

d) Draw the neat sketch of Fly Press and label the parts.

e) Explain seam welding with neat sketch.

f) Define die and punch with the respect to press.

Q.6 Attempt any **FOUR** (16)

a) Describe any two press working operations.

b) List different types of flames produced in gas welding. Describe them.

c) What you know about soldering and brazing?

d) Sketch different sections of rolled parts. State their application.

e) State advantages and limitations of hot rolling and cold rolling.

f) List various plastics along with their application.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: IV | PROGRAM: MECHANICAL ENGG.

COURSE CODE: MEE401 | COURSE NAME: **Power Engineering**

MAX. MARKS: 80 | TIME: 3 HRS. | DATE: 21/04/2016

Instruction:-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I **Marks**

Q.1 Attempt any **FOUR** **(08)**

a) Classify I.C. engines on the basis of

i) Cycle of combustion ii) Arrangement of cylinders

b) Define the terms i) Bore ii) Stroke related to I.C.engines.

c) Represent the Duel combustion cycle on p-v diagram.

d) State the different Pollutants in the exhaust gases of S.I. and C.I. engines.

e) Define i)Indicated Power ii) Brake power related to I.C. engine.

f) What is function of carburetor?

Q.2 Attempt any **TWO** **(16)**

a) A diesel cycle engine has compression ratio of 17. Determine the loss in its idel efficiency when its fuel supply cut off is changed from 6.5% to 9.5% of the stroke Assume clearance volume to be unity and Y as 1.4

b) i) Compare the two stroke engine with four stroke engine with respect any four parameters.

ii) Describe the "controlled combustion" stage related with C.I. engine combustion.

c) Following observations were recorded during a trial on Four stroke cycle, single cylinder engine working on Otto cycle.

i)	Indicated Power	= 14.53 KW
ii)	Mechanical Efficiency	= 72.62%
iii)	Heat supplied	= 2436.66 KJ/min
iv)	Calorific value of fuel	= 43000 KJ/kg
v)	Mass of Jacket cooling water	= 7 kg/min
vi)	Rise in temperature of Jacket cooling water	= 27^0 C
vii)	Mass of Exhaust Gas	= 0.622 kg/min
viii)	Exhaust Gas temperature	= 410^0C
ix)	Room Temperature	= 30^0C
x)	Specific heat of Exhaust Gas	= 1.005 KJ/kg K
xi)	Specific heat of water	= 4.187 KJ/Kg K

i) Calculate Brake Thermal Efficiency

ii) Brake power

iii) Prepare a heat balance sheet on minute basis.

P.T.O.

Q.3 Attempt any TWO (16)

a) i) List the different types of fuels used in I.C. engines.

ii) State the function of crank, connecting rod, piston and cylinder head of I.C.engine.

b) Explain with neat sketch, construction and working of battery ignition system of S.I. engine.

c) i) Explain any one method of measurement of pollutants of I.C.engine.

ii) The following results refer to test on a petrol engine.

Indicated power	= 32 kw
Brake power	= 27 kw
Engine speed	= 1000 RPM
Fuel per brake power hour	= 0.36 kg
Calorific value of fuel	= 43900 KJ/kg

Calculate 1) Indicated thermal efficiency.
2) Brake thermal efficiency.

Section – II **Marks**

Q.4 Attempt any FOUR (08)

a) Define isothermal efficiency of air compressor. State various methods used to increase isothermal efficiency of air compressor.

b) Write classification of rotary air compressor.

c) Write advantages of ram jet engine.

d) List various components of closed cycle gas turbine.

e) State applications of rotary compressor.

f) Write classification of Jet propulsion system.

Q.5 Attempt any FOUR (16)

a) Write advantages & disadvantages of reciprocating air compressor.

b) Compare closed cycle gas turbine with open cycle gas turbine.

c) Compare reciprocating air compressor with rotary air compressor.

d) Draw a neat sketch of ramjet & label it's parts.

e) Explain with neat sketch working of vane type rotary compressor.

f) List various methods used to improve thermal efficiency of gas turbine & explain any one method with neat sketch.

Q.6 Attempt any TWO (16)

a) i) Explain with neat sketch Construction & working of two stage reciprocating air compressor with inter cooler.

ii) In a single stage single acting reciprocating air compressor, initial pressure is 1 bar, volume 0.0133 m^3 & delivers air at 15 bar. Index of compression is 1.3 Find the power required to drive the compressor if compressor speed is 350 rpm.

b) i) With neat sketch explain working of open cycle gas turbine.

ii) Draw only a neat sketch of liquid propellant rocket engine & label it's parts.

c) A single acting two stage reciprocating air compressor with complete inter-cooling delivers 10 kg/min of air at 16 bar. The suction occurs at 1 bar & 15^0C. The index of compression is 1.25 calculate isothermal efficiency if compressor runs at 400 rpm.

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ODD TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL : **Fourth** PROGRAM: **MECHANICAL ENGG.**

COURSE CODE : **MEE402** COURSE NAME: **MACHINE DESIGN**

MAX. MARKS : **80** TIME: **3 HRS.** DATE: **22/04/2016**

Instruction:-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **FOUR** **(08)**

a) List the steps involved in general design process.

b) State the following materials specification
i)FG 200 ii) WM 400

c) Write any four benefits of standardization.

d) Define principal stress.

e) Draw stress-strain diagram for ductile material show different region.

f) Suggest suitable material for the following machine parts
i)Lathe bed ii)Hydraulic Cylinder.

Q.2 Attempt any **TWO** **(16)**

a) What are the aesthetic consideration in design.

b) Write any four strength equations in design of socket and spigot cotter joint.

c) What are the types of threads used in power screw?

d) A wall bracket is attached to wall by means of four bolts, two at a distance of 50 mm from the lower edge and remaining two at a distance of 450 mm from the lower bolts. It supports a load of 50kN at a distance of 500 mm from the wall. Sketch the arrangements and estimate the diameter of bolts. Assuming working stress in tension as 80 N/mm^2

e) Write advantages of power screw.

f) Find the diameter 'd' of shaft if torsional moment 1.5 KN.m and bending moment 2KN.m at the crank pin. Take yield point stress as 600MPa and factor of safety as 4. Use maximum shear stress theory.

Q.3 Attempt any **FOUR** **(16)**

a) Explain maximum shear stress theory.

b) Explain "How to improve efficiency of power screw ?"

c) Determine safe tensile load for bolts of M20 and M36. Assume the bolts are not initially stressed and take safe tensile stress as 200MPa.

d) Differentiate between cotter joint and knuckle joint.

e) What do you understand by bolt of uniform strength ? Explain with neat sketch.

f) A lead screw of lathe has square threads of 24mm outside diameter and 5 mm pitch. In order to drive tool carriage the screw exerts an axial force of 2.5KN. Find the efficiency of screw and power required to drive the screw, if it rotates at 300 rpm. Neglect the bearing friction. Assume coefficient of friction for screw thread as 0.12

P.T.O.

Section – II

Marks

Q.4 Attempt any **FOUR** **(08)**

a) Represent fluctuating stress on stress –time diagram.
b) Represent S-N diagram and define endurance stress.
c) Define "stress concentration" and stress concentration factor.
d) Why flexible coupling is more popular in practice.
e) Draw neat sketch of spur gear and give its use.
f) Define i) Addendum ii) Backlash.

Q.5 Attempt any **FOUR** **(16)**

a) It is required to design a square key of size 8 mm on a shaft diameter of 24mm. The shaft is transmitting 18 KW at 750 rpm. The key is made of steel at yield strength 450N/mm^2 and factor of safety is '3'. Calculate length of key.
b) The rigid flange coupling is used to transmit 22 KW at 650rpm. There are four bolts and pitch circle diameter of bolt is 120mm. The permissible shear stress of bolt material is 50N/mm^2 Determine diameter of bolt.
c) Derive Lewis equation for stress analysis of gear tooth.
d) A 15 tooth spur pinion has a module of 3mm and run at a speed of 1200 rpm. The driven gear has 60 teeth. Find
   i)speed of driven gear.
   ii) diameter of pinion and gear.
   iii) Circular pitch.
e) Give the main four applications of spring.
f) The max. weight acting on spring is 1800 N. The deflection of spring is 80mm. The spring index is '8'. The permissible shear stress is 650 N/mm^2 and modulus of rigidity is 82500 N/mm^2. Calculate
   i)Wire diameter ii) Number of active turns.

Q.6 Attempt any **TWO** **(16)**

a) A shaft 800mm long is supported bet^n two bearings. A 200mm dia. Pulley is keyed on it at a distance of 300mm from left bearing. The pulley receive 12 kw at 800rpm. The angle of contact of belt is 180^0 and coefficient of friction is 0.3 and belt is vertical Neglect weight of pulley. Calculate diameter of shaft if permissible shear stress is 60 N/mm^2
b) Derive a relation for stress equation and deflection equation for Helical compression spring.
c) Describe with neat sketch any Four type of bearing.

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EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **THIRD** PROGRAM: **MECHANICAL ENGINEERING**

COURSE CODE: **MEE305/ME205/M205/2205** COURSE NAME: **THEORY OF ENGINEERING DESIGN**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **22/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

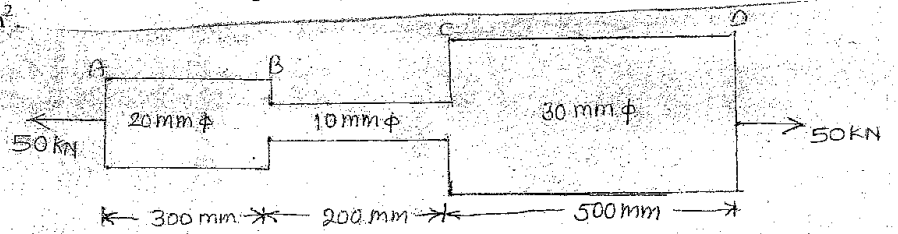
Marks

Q.1 Attempt any **FOUR** **(08)**

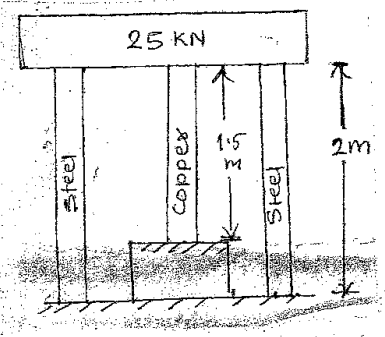
a) Define linear strain & latral strain.
b) State the relation between three elastic constant with meaning of each notation.
c) Define modular ratio.
d) Define resilience.
e) State the relation between bending bending moment, shear force & rate of loading.
f) Define radius of gyration.

Q.2 Attempt any **FOUR.** **(16)**

a) A brass bar is as shown in fig No.1 find total change in length. E_{Brass}=1.05 x10^5 N/mm^2.



b) Two steel rods & one copper rod each of 20mm ϕ together support a load of 20KN as shown in fig.No.2 find stress in each material. E_s=210 GPa, E_c=110GPa.

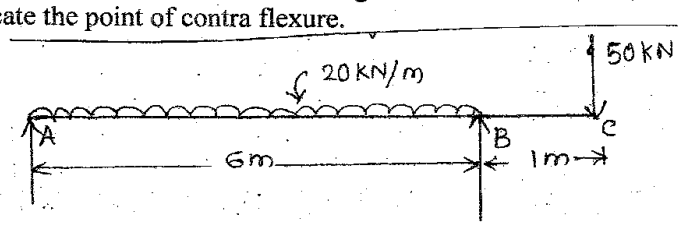


c) A cube of 400mm side is subjected to tensile 50KN, 60KN, 70KN in x, y, z directions of E=200GPa & μ=0.28. Find strain in each direction.
d) An unknown weight falls through 20mm on a collar attached rigidly to the lower end of rod 2m & 600mm^2 in c/s. Determine the value if unknown weight if maximum stress in the rod is 150MPa. Take E=200 KN/mm^2.
e) An iron bar 50mm in diameter has to resist energy of 200Joule. If the maximum instantaneous stress of 150 N/mm^2 is not to be exceed then calculate length of bar to be provided to resist energy. Take E=180KN/mm^2.
f) A hollow circular section of external diameter 100mm has a uniform thickness of 10mm. calculate it's moment of inertia with respect to-
   i) Diameter ii) Tangent to circle iii) The axis parallel to & 20mm below tangent. Also find polar moment of Inertia of circle.

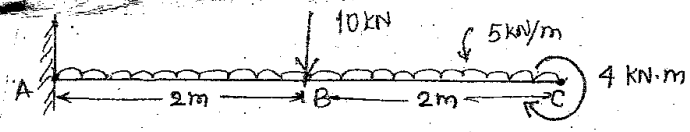
P.T.O

Q.3 Attempt any **TWO** **(16)**

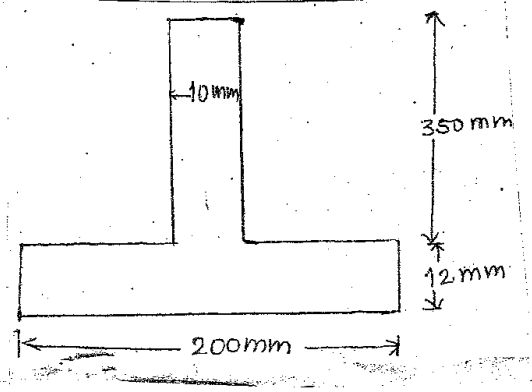
a) A beam is supported & loaded as shown in fig.No.3. Draw SFD & BMD with calculations & locate the point of contra flexure.



b) A cantilever beam of span 4m is loaded as shown in fig.No4. Draw SFD & BMD with calculations.



c) Calculate moment of Inertia of given fig. about both centroidal axes.



Q.4 Attempt any **FOUR** **(08)**

a) Define flexural Rigidity & state its unit.
b) Write formula for shear stress & explain the terms in it.
c) Write the relation between max & average shear stress for rectangle & circular section.
d) Define principal stress & principal planes.
e) Draw Mohr's circle for particle subjected to pure shear stress only.
f) Give the torsional formula with meaning of each term.

Q.5 Attempt any **TWO** **(16)**

a) A 'I' section used as simply supported beam of span 4m. Calculated the safe UDL, the beam can carry without exceeding bending stress 165N/mm^2. Symmetrical 'I' section consist flanges & web section is of 200mm x 10mm.
b) Draw shear stress distribution across the circular section of 100cm used as s/s beam of span 4m carrying UDL of 20KN/m. Also find out ratio of maximum shear stress to average shear stress.
c) Determine diameter of solid circular shaft to carry torsion of 20KN.m with permissible shear stress 100N/mm^2 & twisting angle 1.3^0 per meter. Assume modulus of rigidity 80GPa.

Q.6 Attempt any **TWO** **(16)**

a) A circular shaft of diameter 300mm external with thickness 20mm is subjected to compressive load of 80KN at 100mm eccentric to axis of member. Calculate max & min. stresses produced due to eccentric loading. Also draw stress distribution diagram at base.
b) A strained media subjected to mutually perpendicular stress 100N/mm^2 (tensile) & 60N/mm^2 (compressive) along with 20 N/mm^2 shear stresses clockwise to vertical. Calculate
   i) Resultant stress on oblique plane 30^0 clockwise to vertical plane
   ii) Position of principal planes & principal stresses on it. Use analytical or graphical methods.
c) A hollow propeller shaft of a steam ship is to transmit power of 3800KW at 250rpm. If the internal diameter is 0.8 times the external diameter & max shear stress developed is to be limited to 150N/mm^2, determine the size of shaft.

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GOVERNMENT POLYTECHNIC, KOLHAPUR 416004.

(An Autonomous Institute of Govt. of Maharashtra)

EVEN TERM END EXAM APRIL/MAY -2016

EXAM SEAT NO. | | | | | | |

LEVEL: **FIRST** PROGRAM: **COMMON**

COURSE CODE: **CCE106/X110/R108/0108/106**

COURSE NAME: **ENGINEERING MATHEMATICS**

MAX. MARKS: **80** TIME: **3 HRS.** DATE: **23/04/2016**

Instruction:-

1) Answers must be written in the main answer book provided. (and supplements if required)
2) Figure to the right indicates marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Q.1 Attempt any **FOUR** **Marks (08)**

a) If $(-3,4)$ is the centroid of a triangle whose vertices are $(6,2),(x,3),\&(0,y)$. *find* x & y

b) Find the 1st iteration by using Jacobi's method for the following equation.
$20x+y-2z=17,\quad 3x+20y-z=-18,\quad 2x-3y+20z=25$

c) Find the slope & intercepts of the line $\frac{x}{6}+\frac{y}{4}=\frac{1}{3}$

d) If one end of a diameter of a circle whose centre is (4, 3) is (2, 1). Find the other end of the diameter.

e) Find perpendicular distance of a point (0,5/4) to the line 6x+8y-45=0

f) Find the equation of the circle whose centre is (4, -6) & passing through the point (3,4)

Q.2 Attempt any **FOUR** **(16)**

a) Find the area of the quadrilateral whose vertices are (3, 4), (0, 5), (2, -1) & (3, -2)

b) Find the angle between the lines 3x-4y=420 & 4x+3y=420

c) Find the equation of the tangent at(1, 2) on the circle $x^2+y^2+2x-2y-3=0$

d) Find the roots of the equation $x^3-4x-9=0$ using Bisection method by taking three iterations.

e) Solve the equation $e^x-4x=0$ using Regula- Falsi method by taking three iterations.

f) Solve by Gauss-elimination method $x - y + z = 6$; $2x + 4y + z = 3$; $3x + 2y - 2z = -2$

Q.3 Attempt any **FOUR** **(16)**

a) Find the equation of perpendicular bisector of the line joining the points (-2, 3), (8, -1)

b) Find the equation of the circle whose centre is at (1,-3) & which touches the line $2x - y = 4$

c) By using Newton-Raphson method find a root of the equation $x^4 - x - 9 = 0$ (Three iteration only)

d) Solve the following equation by Gauss-seidal method taking two iterations.
$5x+2y+7z=30$; $x+4y+2z=15$; $x+2y+5z=20$;

e) Solve the following equation by Jacobi's method
$10x + y + 2z = 13$; $3x + 10y + z = 14$; $2x + 3y + 10z = 15$

f) Use Regula- falsi method for finding the root of the equation $x^2 - 2x - 1 = 0$ (carry out three iteration only)

P.T.O

GOVERNMENT POLYTECHNIC, KOLHAPUR – 416004.

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EVEN TERM END EXAM APRIL / MAY 2016

EXAM SEAT NO. | | | | | | |

LEVEL : - **FOURTH** PROGRAM : **MECHANICAL ENGINEERING**

COURSE CODE :- **MEE406/ME306/M306/2307**

COURSE NAME :- **HYDRAULIC MACHINERY**

MAX. MARKS : **80** TIME : **3 HRS.** DATE :- **23 / 04 / 2016**

Instruction :-

1) Answer to two sections must be written in separate section answer book provided.
2) Figure to the right indicate marks.
3) Illustrate your answers with sketches wherever necessary.
4) Use of non-programmable pocket calculator is permissible.
5) Mathematical and other tables shall be made available on request.
6) Assume additional suitable data necessary.
7) Use of Mobile is strictly prohibited.

Section – I

Marks

Q.1 Attempt any **FOUR** (08)

a) Define viscosity and state is S.I. unit.
b) Define vapour pressure and surface tension.
c) $4m^3$ volume of an oil weighs 30.2KN. Determine the specific gravity of the oil.
d) Define mass density. How much is the mass density of water?
e) Find the pressure at a point 1.75m below free surface of water.
f) State various types of fluid flow and define laminar flow.

Q.2 Attempt any **FOUR** (16)

a) One litre of crude oil weighs 9.6N. Calculate its specific weight, density and specific gravity.

b) Define absolute, vaccum and gauge pressure, and atmospheric pressure and show their relationship on a chart.

c) The right limb of a simple U tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp. Gravity 0.9 is flowing. The centre of the pipe is 12cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20cm.

d) Derive an expression for discharge through venturimeter.

e) State Bernoulli's theorem and state its limitations.

f) Find the head lost due to friction in a pipe of dia 300mm and length 50m through which water is flowing at a velocity of 3m/s using Darcy's formula, take f=0.00256.

Q.3 Attempt any **FOUR** (16)

a) A circular plate 3.0m diameter is immersed in water in such a way that its greatest and least depth below the free surface are 4m and 1.5m respectively. Determine the total pressure on one face of the plate and position of centre of pressure.

b) What are the different pressure measuring instrument? Explain any one with neat sketch.

P.T.O.

c) A horizontal venturimeter with inlet and throat diameters 30cm and 15cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 30cm of mercury. Determine the rate of flow Take Cd=0.99.

d) Define Hydraulic gradient line and total energy line.

e) Explain how you will determine velocity of flow at any point with the help of pitot tube.

f) What are the different minor losses in flow through pipes. Give formulas to calculate them.

Section – II Marks

Q.4 Attempt any **FOUR** (08)

a) Define terms impact of jet and jet propulsion.

b) State the functions of i) Surge tank ii) Penstocks in hydroelectric power plant.

c) What is cavitations in turbines?

d) List any four advantages of Francis turbine.

e) Why is a reciprocating pump not coupled directly to the motor? Give reason.

f) State applications of reciprocating pump.

Q.5 Attempt any **FOUR** (16)

a) Explain construction and working of Pelton wheel turbine.

b) Why draft tube is provided in case of reaction turbine? Sketch elbow type circular draft tube.

c) Define the term specific speed in case of a turbine if specific speed of turbine is 68 rpm determine the type of turbine.

d) A centrifugal pump is to be discharge 0.120 m^3/sec at a speed of 1500 rpm against head of 25m. The impeller outer diameter is 250mm and its width at outlet is 50mm and Manometric efficiency is 75%. Determine the vane angle at outer periphery of the impeller.

e) What is air vessel? Explain the function of air vessel for reciprocating pumps.

f) Explain construction, working principle of single acting reciprocating pump.

Q.6 Attempt any **TWO** (16)

a) Water is flowing through a pipe of the end of which a nozzle is fitted. The diameter of the nozzle is 100mm and the head of water at the center of nozzle is 100m. Find the force exerted by the jet of water on a fixed vertical plate. The coefficient of velocity is given as 0.95.

b) What is the difference between impulse turbine and reaction turbine, give atleast eight points?

c) Explain with neat sketches the types of impellors of centrifugal pump.

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