

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-134
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Theory of Machines - I
(OLD)

[Time: Three Hours]

[Max. Marks: 80]

- N.B
- Please check whether you have got the right question paper.
- i) Q.No.1 from section A and Q.No.6 from section B are compulsory.
 - ii) Attempt any two questions from remaining from each section.
 - iii) Assume suitable data, if required.

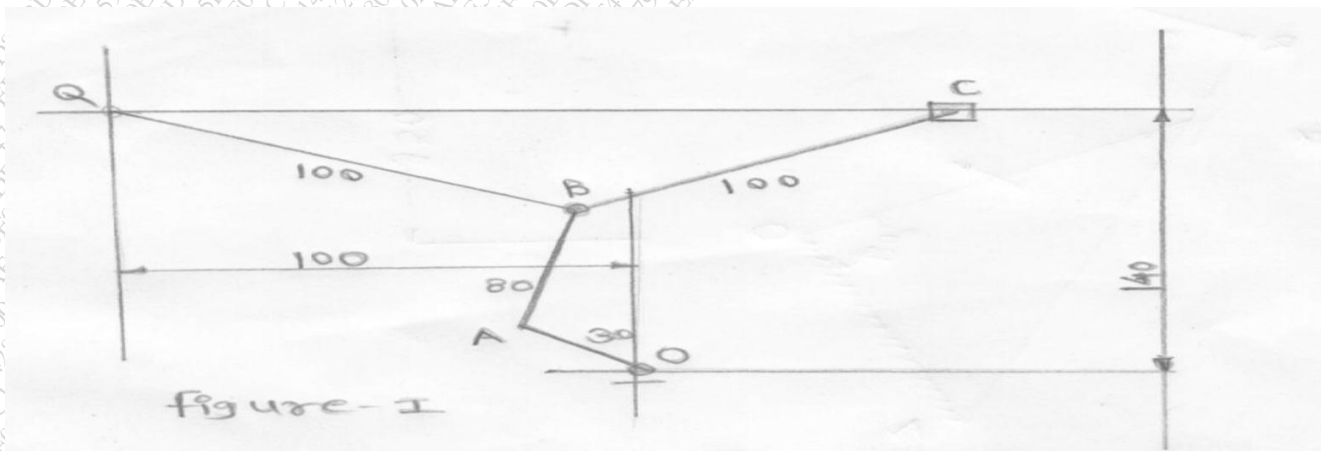
Section A

Q.1 Attempt any five

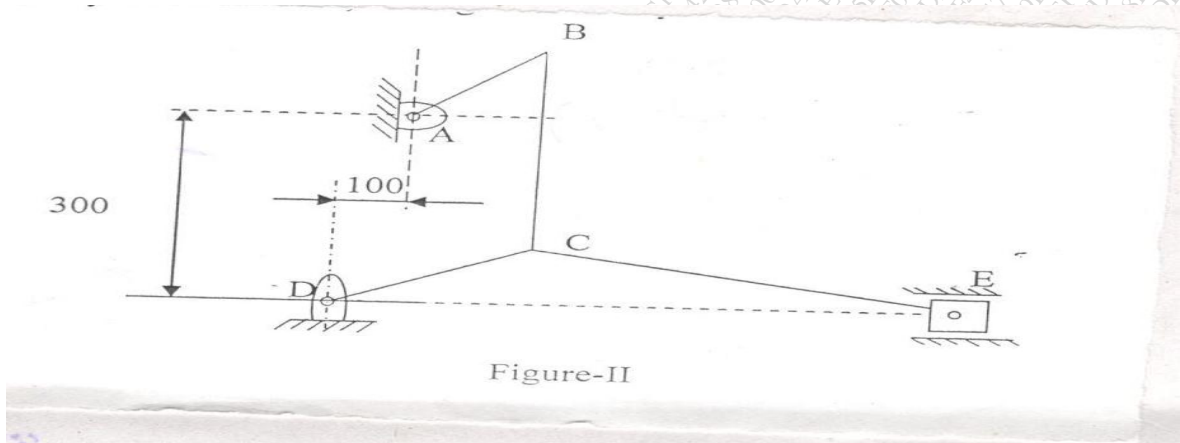
10

1. What do you mean by mechanism?
2. What is kinematic & dynamics?
3. Define lower pair with one example
4. Write the Gruebler's formula for degree freedom of a mechanism.
5. What will be the rubbing velocity at pin joint
When the two links move in the opposite direction?
6. Sketch any two inversions of single slider crank chain.
7. Explain with neat sketch, the body centrede.
8. What is coriolis component of acceleration?
9. Formulate two components of acceleration
10. What is velocity of rubbing?

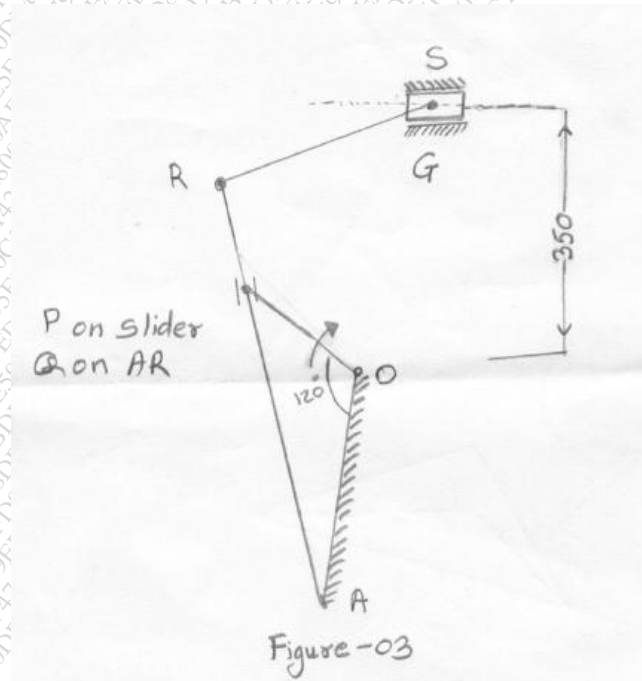
Q.2 A toggle mechanism shown in fig 1. Along with dimensions of the link in mm. find the velocities of 15 point B & point C and the angular velocities of the link AB, BQ, and BC. The crank OA makes an angle of 45° with the horizontal & rotates at 50 rpm the clockwise direction.



- Q.3 Locate all the instantaneous centers of the mechanism as shown in figure II. The lengths of various links are: $AB=150\text{mm}$, $BC=300\text{mm}$, $CD=225\text{mm}$ and $CE=500\text{mm}$. The crank AB rotates in the anticlockwise direction at a uniform speed of 240 rpm and makes an angle of 30° with the horizontal; Find:- 1) Velocity of slide E
2) Angular velocity of link BC & CE .



- Q.4 A quick return mechanism of slotted lever type is shown in fig 3. The various dimensions of which are $OA=400\text{ mm}$, $OP=200\text{mm}$, $AR=700\text{mm}$, $RS=300\text{mm}$. The driving crank OP rotates at 210 rpm clockwise for configuration determine-i) Velocity & acceleration of the link's ii) Angular acceleration of the link RS



- Q.5 The following data refer to a steam engine: 15
 Diameter of piston=240mm, Stroke=600mm, length of connecting rod=1.5m, Mass of the reciprocating parts=300kg, mass of connecting rod=250kg, speed=125 rpm, Centre of gravity of connecting rod from crank pin=500 mm, Radius of gyration of the connecting rod about an axis through Centre of gravity=650mm. Determine the magnitude & direction of torque exerted on the crank shaft when the crank has turned through 30° from inner dead Centre

SECTION B

- Q.6 Attempt any five 10
1. Classify cam according to shape of follower.
 2. Sketch and label a cam profile.
 3. What is displacement diagram in cam?
 4. What are the various types of brakes?
 5. Distinguish between brakes & dynamometers
 6. What is meant by self-energized brake?
 7. What is the necessity of balancing?
 8. What is meant by static & dynamic unbalance in machinery?
 9. Deduce expression for swaging couple
 10. What do you mean by primary & secondary unbalance in reciprocating engines?
- Q.7 Draw the profile of a cam operating a roller reciprocating follower and with the following data: 15
 Minimum radius of cam=25mm, lift=30mm, roller diameter=15mm.
 The cam lifts the follower for 120° with SHM followed by a dwell period of 30° . Then the follower lowers down during 150° of the cam rotation with uniform acceleration & deceleration followed by a dwell period. If the cam rotates at the uniform speed at 150 rpm, calculate the maximum velocity & acceleration of the followers during decent period.
- Q.8 A differential band brake has a drum with a diameter of 800mm. The two ends of the band are fixed 15
 to the pins on the opposite sides of the fulcrum of the lever at a distance of 40mm & 200mm from the fulcrum. The angle of contact is 270° and the coefficient of friction is 0.2. Determine the brake torque when a force of 600 N is applied to the lever at a distance of 800mm from the fulcrum
- Q.9 A, B, C and D are four masses carried by a routing shaft at radii 150 mm, 150 mm, 100 mm & 200 mm 15
 respectively. The planes in which masses rotate are spaced at 300 mm apart and the magnitude of the masses B, C and D are 10kg, 6 kg, and 5 kg, respectively. Find the required mass A and their relative angular settings of the four masses so that shaft shall be in complete balance
- Q.10 A two cylinder uncoupled locomotive has inside cylinders 60 cm apart. The radius of each crank is 30 15
 cm. The cranks are at right angles. The weight of the revolving mass per cylinder is 2452.5 N and the weight of the reciprocating mass per cylinder is 2943 N. The whole of the revolving and $\frac{2}{3}$ 'rd of the reciprocating masses are to be balanced and the balanced weights are placed, in the planes of rotation of driving wheels at radius of 80 cm. The driving wheels are 2 m in diameter & 1.5 m apart. If the speed of the engine is 80 km/hr find the hammer blow, maximum variation of tractive effort & maximum swaying couple.

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-133
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Thermodynamics -II
(REVISED)

[Time: Three Hours]

[Max. Marks: 80]

N.B Please check whether you have got the right question paper.

- N.B
- 1) Attempt any three questions from each section.
 - 2) Use of steam table, mollier diagram permitted.
 - 3) Assume suitable data, if required.

Section A

- Q.1 In a boiler trial of one hour duration, following observations are made, steam generated = 5250 kg 13
 Fuel burnt = 695 kg
 Calorific value of fuel = 30,200 Kj/Kg
 Steam condition = 0.94 dry
 Boiler pressure = 12 bar
 Temperature at hot well = 47°C
 Temp. of steam leaving super heater = 240°C
 Calculate (i) Equivalent evaporation without and with super heater
 (ii) Boiler efficiency with and without super heater
- Q.2 a) Explain construction and working of Cochran Boiler. 07
 b) Derive the condition for maximum discharge through chimney. 06
- Q.3 a) A 40 meter high chimney is discharging flue gases at 350°C, when the ambient temperature 09
 is 30°C. The quantity of air supplied is 18 Kg/kg of fuel burnt.
 Determine:- i) Draught produced in mm of water
 ii) Velocity of flue gases leaving chimney.
- b) Discuss various types of nozzles. 04
- Q.4 a) Explain isentropic flow through nozzle. 05
 b) A nozzle is designed to expand steam at rate of 0.1 Kg/s from 5 bar, 210°C to 1 bar. 08
 Determine exit area of nozzle neglect inlet velocity.
- Q.5 Short note on (any two) 14
 i) IBR Laws
 ii) Artificial draught
 iii) Metastable flow through nozzle.

Section B

- Q.6 a) Explain Ejector condenser with neat sketch. 07
- b) Differentiate between jet condenser and surface condenser. 06
- Q.7 a) Explain Carnot cycle by using P-V & T-S diagram. 05
- b) Discuss in detail the effect of inlet pressure and back pressure on performance of Rankine cycle. 08
- Q.8 a) A steam power plant operating on Rankine cycle works between pressures of 40 bar and 0.05 bar. If steam supplied to turbine is dry saturated find thermal efficiency of cycle. 07
- b) Describe centrifugal compressor with neat sketch. 06
- Q.9 A single-stage, single acting air compressor delivers air at 7 bar. The pressure and temp. at the end of suction stroke are 1 bar and 27°C. It delivers 2 m³ of free air per minute when the compressor is running at 300 rpm. The clearance volume is 5% of stroke volume. The index of compression is 1.3 and index of expansion is 1.35. Calculate. 13
- Volumetric efficiency
 - Indicated power
 - Brake power, if mechanical efficiency is 80%.
- Q.10 Short note on:- (Any two) 14
- Cooling towers
 - Feed water heaters
 - Intercoolers

Total No. of Printed Pages:05

SUBJECT CODE NO:- H-111
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (All Branches)
Engineering Mathematics - IV
(REVISED)

[Time: Three Hours]

[Max. Marks: 80]

Please check whether you have got the right question paper.

N.B

1. Q. No. 1 and 6 are compulsory
2. Solve any two questions from the remaining questions of each section
3. Figures to the right indicate full marks
4. Assume suitable data, if necessary

Section A

Q.1 Attempt any five

10

1. Find the Laplace transform of $\sin 2t \sin 3t$
2. Find Laplace transform of $t^2 H(t-2)$
3. Find Laplace transform of $f(t) = (t-2)^2, t > 2$
 $= 0, t < 2$
4. Find the inverse Laplace transform of $\frac{s+2}{s^2-4s+13}$
5. Find the inverse Laplace transform of $\frac{s e^{-3s}}{s^2-1}$
6. Form the partial differential equation from

$$(x-h)^2 + (y-k)^2 = a^2 - z^2$$

OR

Find Z-transform of $\sin h\left(\frac{k\pi}{2}\right), k \geq 0$

7. Solve: $pq = p + q$

OR

Find the z-transform of $ke^{ak}, K \geq 0$

8. Solve $x \frac{\partial z}{\partial x} - 4y \frac{\partial z}{\partial y} = 0$
OR

Find the z -transform of $2^k \cos h \propto k, k \geq 0$

Q.2 a. Find the Laplace transform of $\int_0^t t \cos^2 t dt$ 05

b. Find the inverse Laplace transform of $\tan^{-1}(s)$ 05

c. Solve: $p^2 + q^2 = Z$ 05

OR

Find z -transform of $\cos\left(\frac{k\pi}{3} + 5\right)$

Q.3 a. Evaluate: $\int_0^\infty e^t \frac{\sin^2 t}{t} dt$ 05

b. Find the inverse Laplace transform by using convolution theorem 05

c. Solve $x^2 p + y^2 q + z^2 = 0$ 05

OR

Find the inverse z - transform of $\frac{z}{(z-2)(z+3)^2}, |z| > 3$

Q.4 a. Find the Laplace transform of periodic function 05

$$f(t) = E, 0 < t < \frac{p}{2}$$

$$= -E, \frac{p}{2} < t < p$$

And $f(t) = f(t + p)$

b. Solve by Laplace transform $y'' + 2y' + 5y = e^{-t} \sin t$; given that $y(0) = 0, y'(0) = 1$ 05

c. Obtain the solution of $\frac{\partial v}{\partial t} = k \frac{\partial^2 v}{\partial x^2}$ under the conditions 05

- i. $v \neq \infty, t \rightarrow \infty$
- ii. $v = 0, \text{ for } x = 0 \text{ and } x = \pi$
- iii. $u = \pi x - x^2$ as $t = 0$ in the range of $(0, \pi)$

OR

Find the z-transform of $k^2, k \geq 0$

- Q.5 a. Express the following function in terms of Heaviside unit step function and hence find its Laplace transform $f(t) = (t + 1), 0 < t < 2$
 $= 3, t > 2$ 05

- b. Solve the simultaneous L.D.E. by Laplace transform method 05

$$\frac{dx}{dt} + 4y = 0, \frac{dy}{dt} - 9x = 0, \text{ given}$$

$$x = 2, y = 1 \text{ at } t = 0$$

- c. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ which satisfies the conditions $u(0, y) = 0 = u(l, y)$ 05

$$\text{And } u(x, \infty) = 0, u(x, 0) = kx$$

OR

Solve the difference equation by using z- transform

$$6y(k + 2) - y(k + 1) - y(k) = 0, k \geq 0$$

$$\text{Given } y(0) = y(1) = 1$$

Section B

- Q.6 Attempt any five 10

- a. Prepare a forward difference table for the data

$$x : 2 \quad 4 \quad 6 \quad 8 \quad 10$$

$$y : 15 \quad 23 \quad 27 \quad 33 \quad 40$$

- b. Find the first approximate value of the root (i.e. x_1) by Newton Raphson method for $\log x - x + 3 = 0$

- c. Find the values of x, y, z in the first iteration of Gauss –Seidal method

$$83x + 11y - 4z = 95$$

$$7x + 52y + 13z = 104$$

$$3x + 8y + 29z = 71$$

- d. Find f(8) for the data

$$x : 5 \quad 6 \quad 9$$

$$f(x) : 12 \quad 13 \quad 14$$

- e. Find the residues at each of its poles of

$$f(z) = \frac{3z^2}{(z-1)(z+3)}$$

- f. Evaluate $\int_c \sinh z \, dz$, where $c : |z| = 1$
- g. Show that $\cosh z$ is analytic every where
- h. State Cauchy-Riemann equations in Cartesian and polar form

Q.7 a. Given that $\frac{dy}{dx} = 2 + \sqrt{xy}$ and $y(1)=1$. Find the approximate value of y at $x=1.2$ using Euler's modified method 05

b. Use runge-kutta fourth order method to find y at $x=0.2$. given that 05

$$\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}, \quad y(0) = 1$$

c. Under the transformation $w = \frac{1}{z}$ find the image of $x^2 + y^2 - 6x = 0$ 05

Q.8 a. Find the root of the equation $x \log_{10} x = 1.2$ by Newton-Raphson method 05

b. Prove that $u = r^3 \cos 3\theta - r \sin \theta$ is harmonic and hence find its harmonic conjugate 05

c. Evaluate by cauchy's Residue Theorem 05

$$\oint_c \frac{z^2}{(z-1)(z+2)^2} dz, \quad c: |z| = \frac{3}{2}$$

Q.9 a. State cauchy's integral formula and hence evaluate 05

$$\oint_c \frac{z+1}{(z^3-4z)} dz, \text{ where } c: |Z + 2| = \frac{3}{2}$$

b. Find the bilinear transformation which maps the points $-1, 0, 1$ into the points $-1, -i, i$ of w -plane respectively 05

c. Fit a second degree parabola to the following data 05

x :	0	1	2	3	4
y :	-4	-1	4	11	20

Q.10 a. Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at $x=0$ for the data 05

x :	0	1	2	3	4
y :	2	5	10	14	19

b. Find the analytic function $f(z) = u + iv$ if $v = \left(r - \frac{1}{r}\right) \sin\theta$ 05

c. Evaluate $\int_0^{\pi - \pi i} e^{\bar{z}} dz$, along the curve $x = t, y = -t$ 05

SUBJECT CODE NO:- H-112
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (All Branches)
Engineering Mathematics -IV
(OLD)

[Time: Three Hours]

[Max.Marks:80]

- N.B
- Please check whether you have got the right question paper.
- i. Q.No.1 and 6 are compulsory.
 - ii. Solve any two questions from remaining of each section.
 - iii. Figures to the right indicate full marks.
 - iv. Assume suitable data, if necessary.

SECTION-AQ.1 Solve any five from the following

10

- a) Find k such that $f(z) = \frac{1}{2} \log(x^2 + y^2) + i \tan^{-1} \left(\frac{ky}{x} \right)$ is analytic.
- b) Find the image of $|z| = 2$ under the mapping $W = z + 3 + 2i$.
- c) State Cauchy's integral theorem.
- d) Determine the singularity and the residue of the function $f(z) = \frac{\sin z}{z}$.
- e) Expand $f(z) = \cos z$ about $z = \frac{\pi}{2}$ by using Taylor's series.
- f) Evaluate $\int_0^{2i} \sin hz \, dz$.
- g) Solve: $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$.

ORFind Z-transform of $F(k) = \frac{1}{k}, k \geq 1$

- h) Solve: $2x \frac{\partial z}{\partial x} - 3y \frac{\partial z}{\partial y} = 0$.

ORFind Z-transform of $F(k) = \frac{a^k}{k!}, k \geq 0$

- Q.2 a) Find the analytic function $f(z) = u(r, \theta) + iv(r, \theta)$ such that $v(r, \theta) = r^2 \cos 2\theta - r \cos \theta + 2$ 05
- b) Evaluate $\int_{(0,0)}^{(1,1)} (3x^2 + 4xy + 3y^2) dx + 2(x^2 + 3xy + 4y^2) dy$ along $y^2 = x$ 05
- c) Evaluate $\int_0^\infty \frac{dx}{(a^2+x^2)^2}$ by using residue theorem. 05

- Q.3 a) Evaluate $\oint_C \frac{\sin^6 z}{(z-\frac{\pi}{2})^3} dz$, where C is $|z| = 2$ by Cauchy's integral formula. 05
- b) Show that the real and imaginary part of analytic function $f(z) = u + iv$ is harmonic function. 05

- c) Obtain the solution of partial differential equation $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$, with subject to the condition $u(0, t) = 0, u(l, t) = 0, u = 3 \sin \frac{\pi}{l} x$, when $t = 0$. For all values of $0 < x < l$. 05

OR

Find Z-transform of $F(k) = 3^k \cos\left(\frac{k\pi}{2} + \frac{\pi}{4}\right), k \geq 0$

- Q.4 a) Find and plot the image of triangular region with vertices (0,0), (0,1) and (1,0) under the transformation $w = (1 - i)z + 3$. 05
- b) Expand $f(z) = \frac{1}{(1-z)(z-2)}$ into Laurent series for $i) 1 < |z| < 2$ 05
- c) Solve $\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$, subject to the conditions 05
- i) $v = 0$ when $y \rightarrow \infty$
 - j) $v = 0$ when $x = 0$ for all values of y
 - k) $v = 0$ at $x = \pi$
 - l) $v = v_0$ when $y = 0$ for $0 < x < \pi$

OR

Solve $y(k + 2) - 5y(k + 1) + 6y(k) = u(k); y(0) = 0, y(1) = 1$

- Q.5 a) Find the bilinear transformation which maps the point $z = 0, -i, -1$ into the points $w = i, 1, 0$. 05
- b) Evaluate $\int_0^{2\pi} \frac{d\theta}{2 + \cos \theta}$ by calculus of residue. 05
- c) The vibration of an elastic string is governed by the partial differential equation $\frac{\partial^2 u}{\partial t^2} = \frac{\partial^2 u}{\partial x^2}$. The π and the ends are fixed. The initial velocity is zero and the initial deflection $u(x, 0) = 2(\sin x + \sin 3x)$. Find the deflection $u(x, t)$ of the vibrating sting for $t > 0$. 05

OR

Find inverse z-transform of $\frac{z^2+z}{z^3-3z^2+3z-1}, |z| > 1$

SECTION-B

- Q.6 Solve any five of the following 10
- a) Find Laplace transform of $e^{-t} \sin t H(t - 2\pi)$
 - b) Find inverse Laplace transform of $\frac{e^{-\pi s}}{s^2+9}$
 - c) Find inverse transform of $\frac{1}{(s+3)^2}$
 - d) State second shifting theorem of Laplace transform
 - e) Find Laplace transform of $t \cos 2t$.
 - f) State inverse convolution theorem of Laplace transform.

- g) Find Fourier transform of $f(x) = x, |x| \leq a$
 $= 0, \text{ otherwise}$
- h) Find Fourier sine transform of $\frac{1}{x}$

Q.7 a) Evaluate $\int_0^\infty \sin 4t \delta(t - \frac{\pi}{8}) dt$ 05

b) Find inverse Laplace transform of $\frac{1}{s} \log \sqrt{\frac{s^2+1}{s^2}}$ 05

c) Find Fourier sine and cosine transform $f(x) = ae^{-ax} - be^{-\beta x}$ 05

Q.8 a) Find Laplace transform of $\frac{\sin^2 t}{t}$ 05

b) Find inverse Laplace transform of $\frac{s^2}{(s^2+a^2)^2}$ 05

c) Solve the integral equation $\int_0^\infty f(x) \cos \lambda x dx = e^{-\lambda}, \lambda > 0.$ 05

Q.9 a) Express the function in terms of Heaviside unit step function hence find their Laplace transform of 05

$$f(t) = 4, \quad 1 < t < 2$$

$$= -2, \quad 2 < t < 3$$

$$= 5, \quad t > 3$$

b) Find f(x) if its Fourier sine transform is $\frac{\lambda}{\lambda^2+1}$ 05

c) Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 5y = e^{-x} \sin x$, where $y(0) = 0$ and $\frac{dy}{dx} = 1$ at $x = 0$ 05

Q.10 a) Find Laplace transform of 05

$$f(t) = 1, \quad 0 < t < 1$$

$$= 0, \quad 1 < t < 2 \quad \text{if } f(t) = f(t+3)$$

$$= -1, \quad t > 2$$

b) Solve $\frac{dx}{dt} - y = e^t; \frac{dy}{dt} + x = \sin t, x(0) = 1, y(0) = 0$ by Laplace transform method. 05

c) Using Fourier transform, solve the equation $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial t^2}$ for $x \geq 0, t \geq 0$ under the given condition $u = u_0$ at $t = 0, t > 0$ and $u(x, 0) = 0, x \geq 0.$ 05

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-203
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Electrical Machines
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i) Q.No.1 and Q.No.6 are compulsory.
 - ii) Solve any two questions from Q.2 to Q.5.
 - iii) Solve any two questions from Q.7 to Q.10.
 - iv) Assume suitable data wherever necessary.
- Section A
- | | | |
|-----|--|----------|
| Q.1 | Attempt the following(any five) | 10 |
| | <ol style="list-style-type: none"> a) Enlist the different types of D.C. generator. b) Give the function of yoke and pole shoes in D.C. generator. c) Why D.C series motor never started on no load? d) What is the purpose of starter in D.C. motor? e) Enlist applications of D.C series motor. f) Write applications of stepper motor. g) Draw the characteristics of D.C servo motor. h) What do you mean by back emf give its significance? | |
| Q.2 | <ol style="list-style-type: none"> a) Explain with neat diagram construction of D.C. machine. b) Derive EMF equation of D.C. generator. | 07
08 |
| Q.3 | <ol style="list-style-type: none"> a) Explain principle and operation of D.C. generator. b) Explain the working of three point starter with neat diagram. | 07
08 |
| Q.4 | <ol style="list-style-type: none"> a) State the factor deciding speed of D.C motor. Explain in detail speed control methods of D.C shunt motor. b) Explain various characteristics of D.C shunt generator. | 08
07 |
| Q.5 | Write short notes (any three) | 15 |
| | <ol style="list-style-type: none"> a) Losses in DC machine b) Types of armature windings c) PMDC motor d) DC servo motor | |

Section B

- Q.6 Attempt the following(any five) 10
- Define slip in an induction motor.
 - Why damper winding is used in synchronous motor?
 - Write applications of hysteresis motor.
 - Define cylindrical type rotor and mention its applications.
 - Define synchronous speed and write its formula.
 - What is hunting in synchronous motor?
 - In synchronous machine which winding is called as rotor?
 - Write applications of shaded pole motor.
- Q.7 a) Derive torque equation of an induction motor for starting condition and running condition. 07
b) Explain the construction details of squirrel cage induction motor. 08
- Q.8 a) Explain the concept of double revolving theory in single phase induction motor. 08
b) Explain capacitor start capacitor run single phase induction motor. 07
- Q.9 a) Derive EMF equation of synchronous generator. 08
b) Explain construction details of cylindrical type rotor. 07
- Q.10 Write short notes (any three) 15
- Starting methods of synchronous motor
 - AC servo motor
 - Hysteresis motor
 - Repulsion motor

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-204
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Electrical Machine & Applied Electronics
(OLD)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B I. Q.No.1 from section A and Q.No.6 from section B are compulsory.
 II. Solve any two questions from the remaining in each section.

Section A

- | | | |
|-----|---|----|
| Q.1 | Attempt any five | 10 |
| | a) Necessity of starter in DC motor | |
| | b) What are selection criteria for motor still mill industries? | |
| | c) Explain working principle of DC motor. | |
| | d) What is rheostatic breaking? | |
| | e) Draw the construction of stepper motor. | |
| | f) What are the applications of universal motor? | |
| | g) Define back EMF & state its significance. | |
| | h) What is slip? | |
| Q.2 | a) Give the comparison between electric breaking and mechanical breaking. | 07 |
| | b) Give details classification of electrical drives. | 08 |
| Q.3 | a) Explain the construction of DC machines. | 07 |
| | b) Draw & explain torque-slip characteristics of three phase induction motor. | 08 |
| Q.4 | a) Draw and explain 4-point starter for DC motors. | 07 |
| | b) Draw & explain construction of slip ring induction motor. | 08 |
| Q.5 | Write short notes on <u>any three</u> . | 15 |
| | a) Cooling and heating of DC motor | |
| | b) Explain the starters of induction motor | |
| | c) V/F control of AC motors | |
| | d) Group drives | |

Section B

- Q.6 Attempt any five 10
- a) What is operating principle of airflow sensor?
 - b) What is SCR?
 - c) Why sequential timer circuit is used?
 - d) Give application of sensor explain any one of them.
 - e) Draw V-I characteristics of DIAC.
 - f) Draw opto coupler.
 - g) What is solenoid valves?
 - h) What is relay? What are its types?
- Q.7 07
- a) Give the detail classification of sensor.
 - b) Explain in details working principle of light dimmer circuit. 08
- Q.8 07
- a) Differentiate TRIAC and DIAC.
 - b) Explain in details working principle of transistor. 08
- Q.9 07
- a) Explain in details 7 segment display.
 - b) What are the types of load cells? Explain construction & working. 08
- Q.10 Write short notes on any three. 15
- a) Construction of relay
 - b) Shaft encoder decoder
 - c) Sequential timer circuit
 - d) MOSFET

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-169
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Thermodynamics – II
(OLD)

[Time: Three Hours]

[Max.Marks:80]

- N.B
- Please check whether you have got the right question paper.
1. Question No.1 and 6 are compulsory from each section A & B.
 2. Solve any two questions from remaining questions in each section A & B.
 3. Use of steam table, mollier diagram is permitted.
 4. Assume suitable data if required.

Section A

- Q.1 Solve any five. 10
- i) Write four boiler mountings.
 - ii) State function of blow-off cock
 - iii) Differentiate between natural circulation and forced circulation type of boiler.
 - iv) Define induced draught
 - v) Differentiate between convergent nozzle and divergent nozzle.
 - vi) Which specific draught is used for locomotive applications.
 - vii) Define nozzle efficiency.
 - viii) Define equivalent evaporation & factor of evaporation.
- Q.2 a) Explain Benson boiler. 07
- b) A steam generator evaporates 18000 kg/hr of steam at 12.5 bar and a quality of 0.95 dry from feed water at 55°C, when coal is fired at the rate of 2040 kg/hr. If the higher calorific value of the coal is 27.4 MJ/kg, find 08
- i) The equivalent evaporation.
 - ii) The efficiency of boiler.
- Q.3 a) Explain different boiler draught. 07
- b) A chimney is 28m high and the temperature of hot gases in the chimney is 320°C. The temperature of outside air is 25°C and furnace is supplied with 15 kg of air per kg of coal burnt. Calculate draught in mm of water. Also calculate velocity of flue gases passing through chimney, if 50% of theoretical draught is lost in friction at the grate and passage. 08
- Q.4 a) Explain super saturated flow through nozzle. 07
- b) Dry saturated steam at 10 bar is expanded isentropically in a nozzle to 0.2 bar using steam tables only, find the dryness fraction of the steam at exit. Also find the velocity of steam leaving the nozzle when 08
- (i) Initial velocity is negligible and
 - (ii) Initial velocity of steam is 120 m/sec.

- Q.5 Write short note on (Any three) 15
- Iserotopic flow-through nozzle.
 - IBR laws
 - Differentiate between induced & forced draught.
 - La- Mont boiler.

Section-B

- Q.6 Solve any five 10
- Define 'Free Air Delivery'
 - What is intercooler
 - Write any two method to achieve isothermal compression.
 - Limitations of Carnot cycle.
 - List the method to improve the performance of Rankine cycle.
 - Write two differences between jet and surface condenser.
 - Write two application of air motor.
 - Functions of cooling tower.

- Q.7 a) What are sources of air leakage and what is its effect on performance of condenser. Explain the method used to reduce air leakage. 08
- b) The following data were obtained from the test of a surface condenser – condenser vacuum=711 mm of Hg. Hot well temperature = 35°C. Inlet temp of circulated water – 12°C. Outlet temp of circulated water = 28°C. Barometer reading = 760mm of Hg. Calculate the vacuum efficiency & condenser efficiency. 07

- Q.8 (a) Explain the effect of back pressure on the performance of Rankine cycle. 07
- (b) A steam turbine receives superheated steam at a pressure of 17 bar and having a degree of superheat of 120°C. The exhaust pressure is 0.07 bar and expansion of steam takes place isentropically. Calculate 08
- The heat supplied.
 - The heat rejected.
 - Net work done.
 - The thermal efficiency.

- Q.9 (a) Explain with neat diagram working of double acting reciprocating compressor. 06
- (b) A two stage air compressor compresses the air from 1 bar and 25°C to 40 bar. If the law of compression is $PV^{1.35} = \text{Const.}$ and intercooling is complete to 25°C, find per kg of air 09
- The work done in compressing
 - The mass of water necessary for abstracting the heat in the intercooler, if temperature rise of cooling water is 20°C. Take $R=287\text{J/Kg-K}$ and $C_p=1\text{KJ/Kg.K}$.

- Q.10 Write short note on (Any three)
- a) Modified Rankine cycle.
 - b) Vacuum pump
 - c) Centrifugal Compressor
 - d) Evaporative condenser

Total No. of Printed Pages:04

SUBJECT CODE NO:- H-324
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Machine Drawing
(OLD)

[Time: Four Hours]

[Max.Marks: 80]

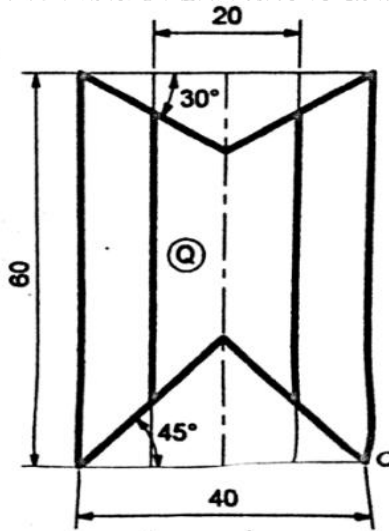
Please check whether you have got the right question paper.

N.B

- 1) All the questions are compulsory.
- 2) Figure to the right indicates full marks.
- 3) Assume suitable data, if & wherever necessary.

Section A

- Q.1
- a) A cylinder of base diameter 60 mm, axis length 95 mm has its base on H.P. An ant moves from extreme left bottom point and reaches the extreme left top point of the cylinder moving around the surface. Show shortest path traced by the ant in elevation & plan. 08
 - b) Hexagonal prism base 20 mm side and height 60 mm is standing on base and on its H.P. Its surface is cut as shown in Fig. No. 1 Draw the development of lateral surface 'Q' of prism. Open the prism from 'O'. 08



Q.2 Draw the following views:-

- i) Front view and top view
- ii) Left hand side view.
- iii) Auxiliary view from direction 'A'.

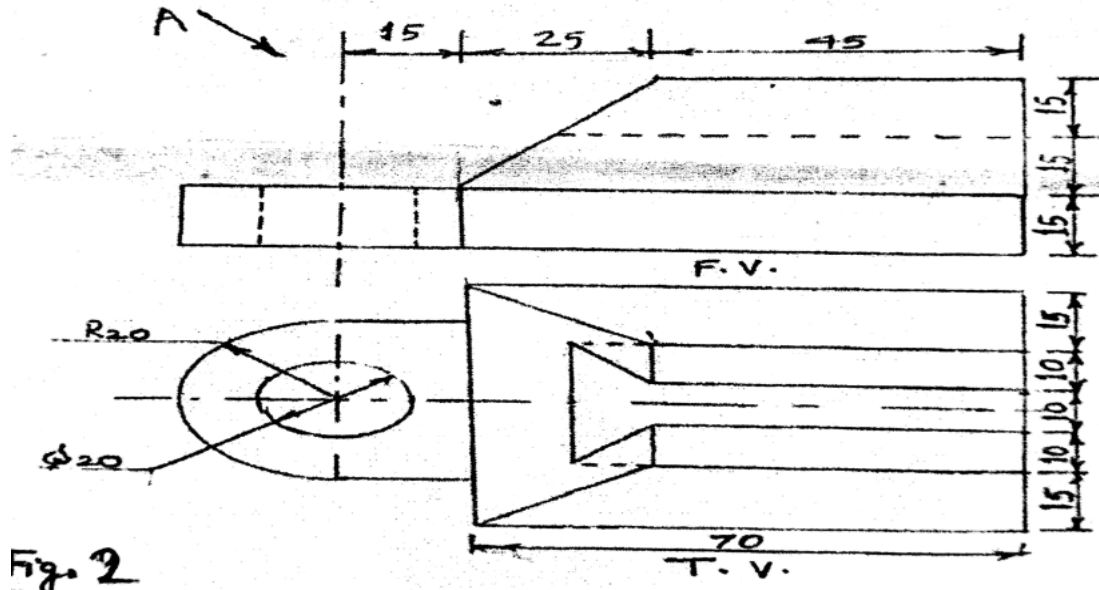


Fig. 2

Q.3 A vertical cone base 80 mm diameter and axis 110mm long is penetrated by a horizontal cylinder, 45 mm diameter. The axis of the cylinder is 25 mm above the base of cone, is parallel to V.P. and is 10 mm away from axis of cone. Draw the projections of solids showing curves of intersection. 12

OR

A vertical square prism, base 50 mm side and height 110 mm has face inclined at 30° to V.P. A square hole of 35 mm sides is cut through it, the faces of which are equally inclined to V.P. and bisecting the axis of vertical prism and show its projections. 12

Section B

Q.4 Draw the conventional representations for the following. 15

1. Bevel gear
2. Cup rivet head
3. Lock Nut
4. Knurling Nut
5. Concrete
6. Semi-elliptic leaf spring with eyes.
7. BSW thread form
8. Roughness grade N12.
9. Straight Knurling.
10. Ellipsoid rivet Head.
11. Bearing
12. Roughness grade N2.
13. Conventional signs of Weld.
14. Square stud.
15. Square thread form.

Q.5 Fig. No. 3 below shows the details of cross head. Assemble all the parts. Tabulate part list and Draw:- i) Half Sectional front view ii) Side view 25

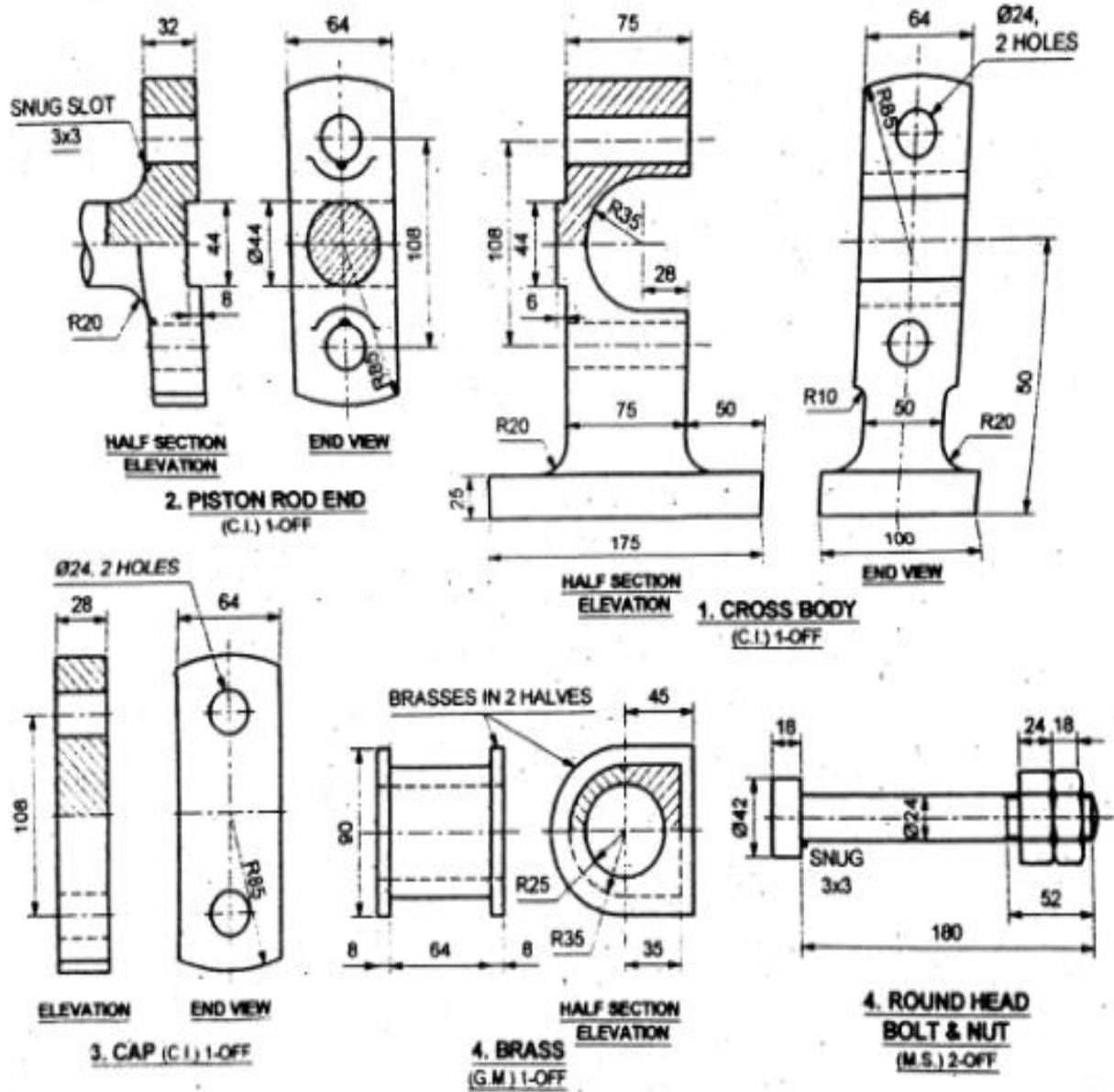
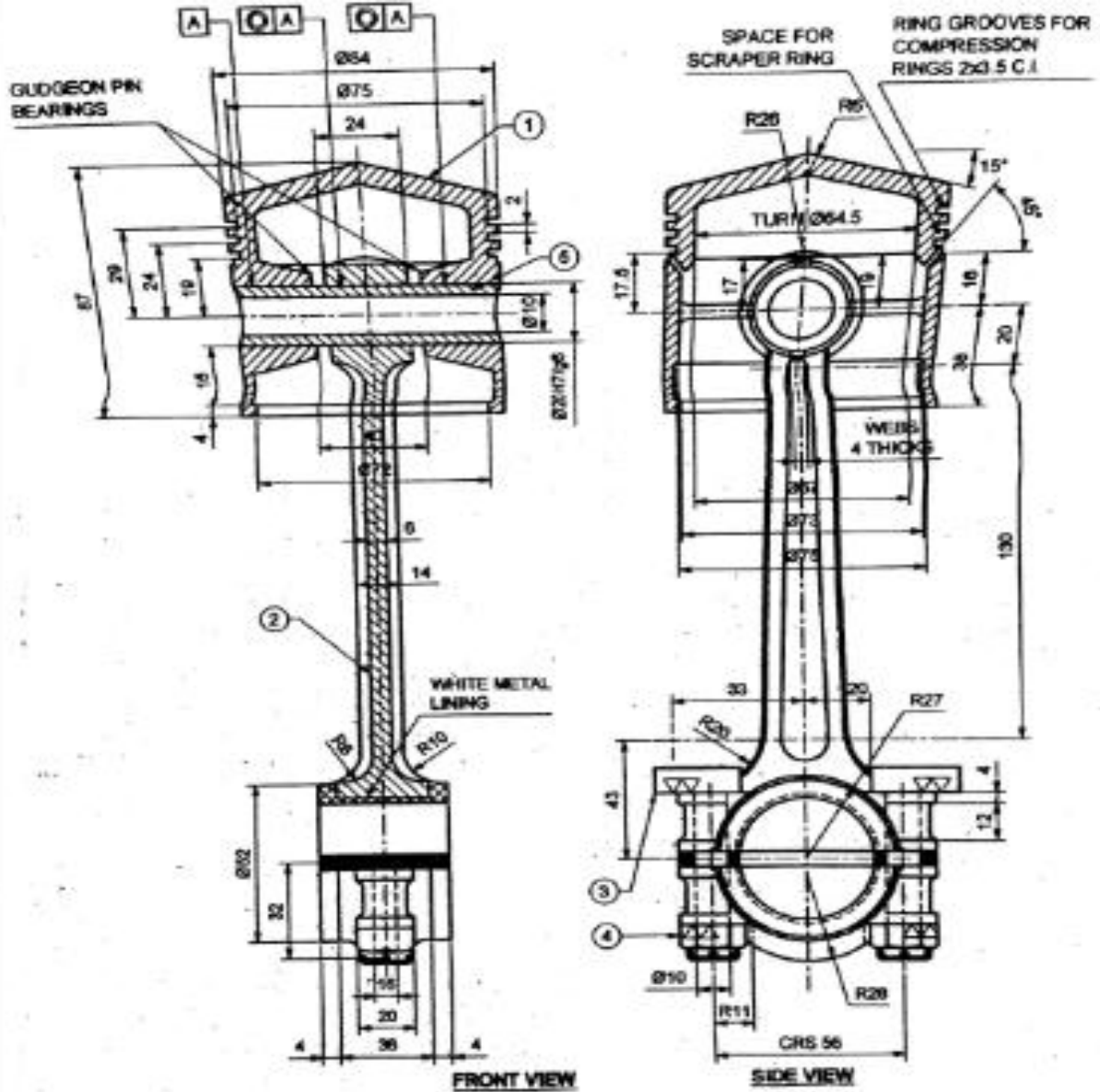


Fig. No. 3

OR

Fig No. 4 show assembly of piston and connecting rod of I.C. Engine.

- i) Piston sectional F.V. & side view
- ii) Connecting rod sectional F.V. and side view.



PART LIST

PART NO.	PART NAME	MATL.	QTY.
1	PISTON	ALLOY ALLOY	1
2	CONNECTING ROD	ALLOY STEEL	1
3	BIG-END BOLT	M.S.	2
4	CASTLE NUT	M.S.	2
5	GUDGEON PIN	HARDENED STEEL	1

FIT CHART

20H7/g6	CLEARANCE FIT
---------	---------------

Fig. No. 4

-Total No. of Printed Pages:04

SUBJECT CODE NO:- H-325
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mechanical) (CGPA)
Machine Drawing
(REVISED)

[Time: Four Hours]

[Max.Marks: 80]

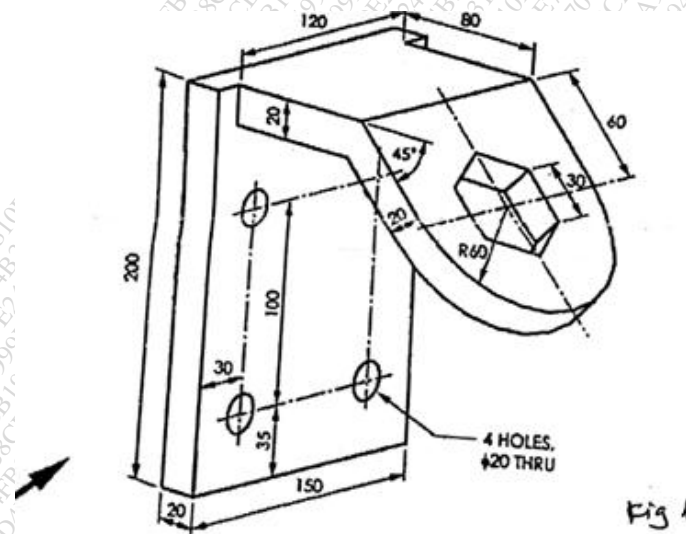
Please check whether you have got the right question paper.

- N.B
- 1) Q.1 and Q.4 is compulsory.
 - 2) Assume suitable data.
 - 3) All dimensions are in mm.

Section A

Q.1 Draw the front view, side view and the auxiliary view of the object shown in Fig. 1. The arrow indicates the direction of viewing for the front view.

14



Q.2 Draw a semicircle of 100 mm diameter and inscribe in it a largest rhombus. If the semi circle is development of a cone and rhombus in some curve on it, then draw the projections of cone showing that curve.

13

OR

A cylinder in resting on H.P. on its base. It is cut by flat cutting planes 1, 2, 4 and 5. As shown in Fig. 2. A central hole in drilled inside the cylinder. It is shown as cutting no.3. Draw the development of the cut cylinder for a diameter of 80 mm.

13

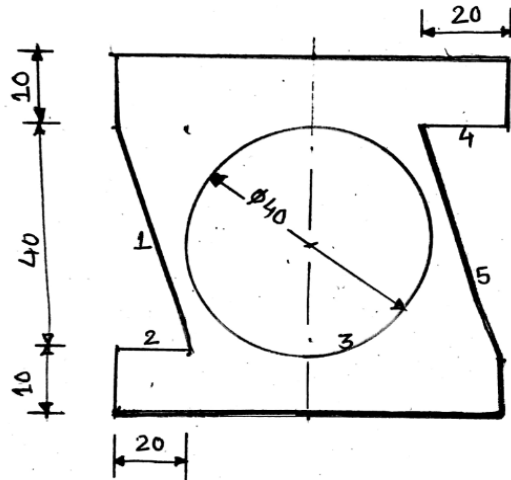


Fig.2.

Q.3 A cylinder of 80 mm diameter and 100 mm axis in completely penetrated by a cone of 80 mm diameter and 120 mm long axis horizontally. Both axis intersect & bisect each other. Draw projections showing curve of intersections. 13

OR

A cylinder 50 mm dia. & 70 mm axis in completely penetrated by a triangular prism of 45 mm sides. And 70 mm axis, horizontally. One flat face of prism is parallel to VP and contains axis of cylinder. Draw projections showing curves of intersections. 13

Section B

- Q.4 Solve any five questions from the following:
- a) Draw the material conventional of: 03
 - i) Lead ii) Glass iii) Petrol
 - b) Give conventions of the following machine elements 03
 - i) Bearing ii) Leaf spring with eyes iii) Splined shaft
 - c) Union pipe joint 03
 - d) Double riveted zig-zag lap joint 03
 - e) Lewis foundation bolt 03
 - f) Draw machining symbol showing following parameters: 03
 - i) Surface roughness 0.8 microns ii) Sampling length 0.7
 - ii) Perpendicular direction of lay

Q.5 Figure 3 shows details of the Plummer block. Assemble all the parts, tabulate the bill of material and draw; 25

- i) Half sectional front view
- ii) Top view

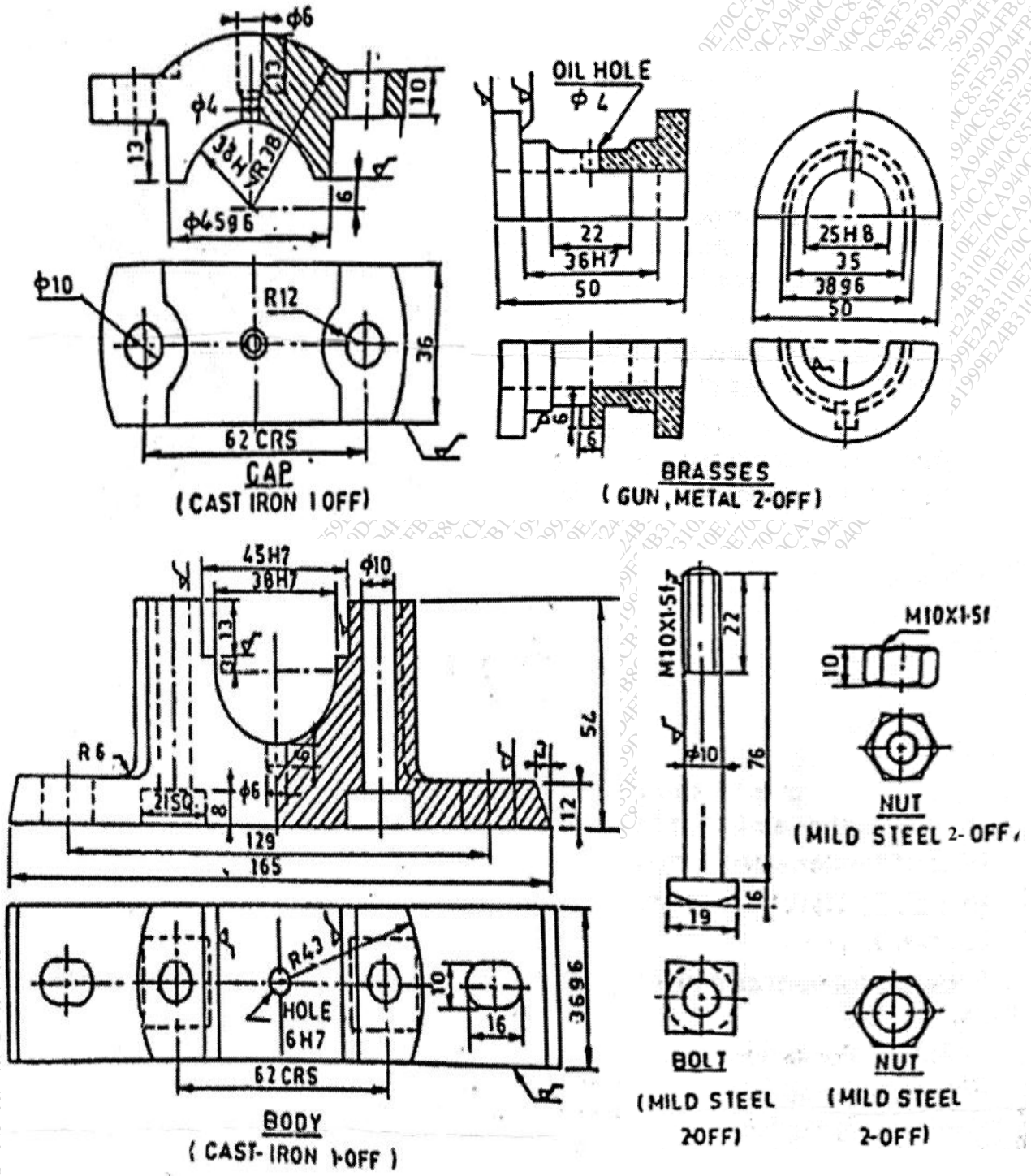
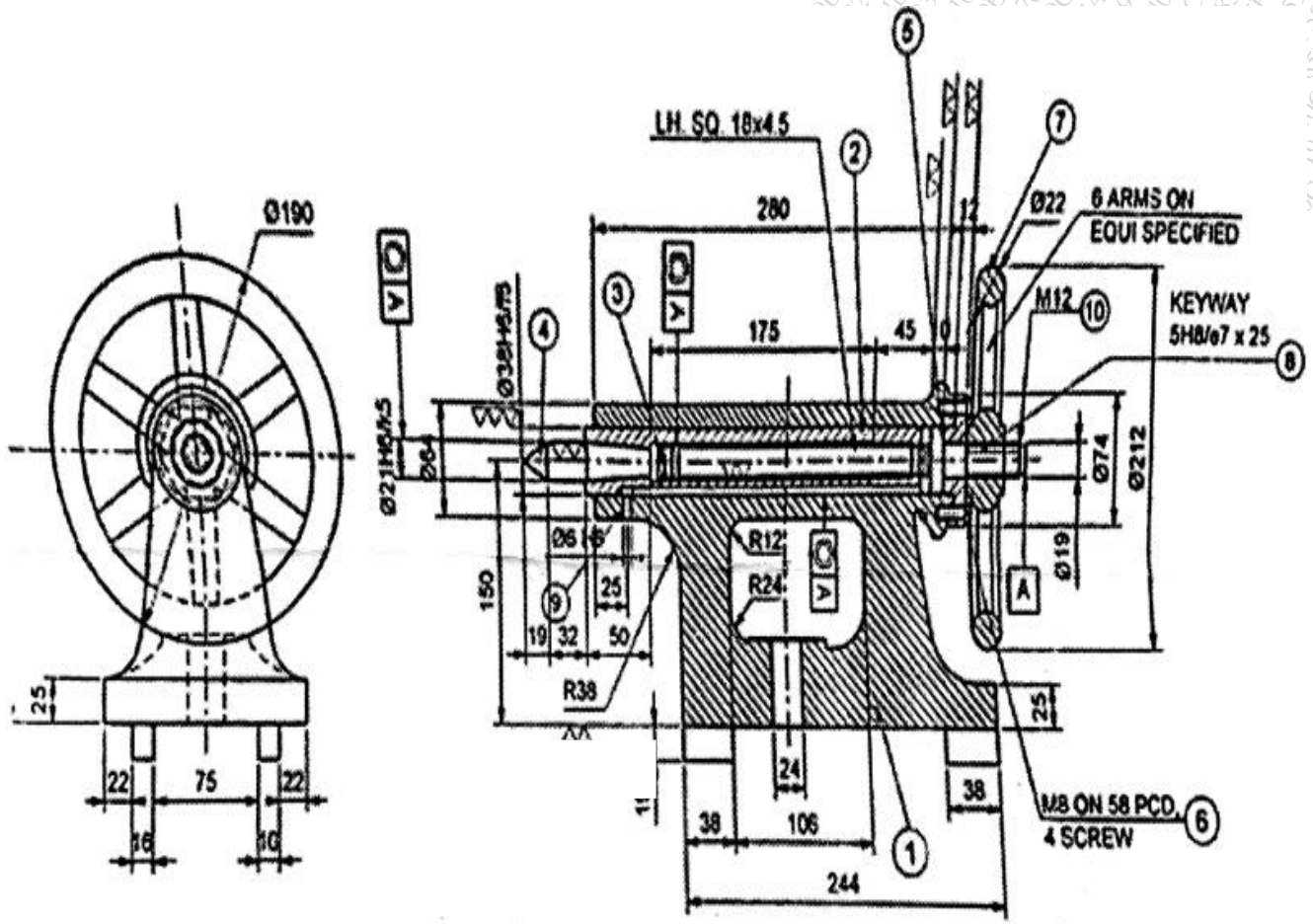


Figure 3

OR

Figure 4 shows assembly of Tailstock of lathe machine along with part list. Draw the details in front view and side view. 25



ASSEMBLY OF TAIL STOCK

PART LIST

PART No.	PART NAME	MATL.	QTY.
1	BODY	C.I	1
2	BARREL	M.S.	1
3	SPINDLE	M.S.	1
4	CENTER	C.S.	1
5	SPINDLE BEARING	C.I.	1
6	SCREW	M.S.	1
7	HAND WHEEL	C.I	1
8	KEY	M.S	1
9	FEATHER	M.S	1
10	NUT	M.S	1

Total No. of Printed Pages:02

SUBJECT CODE NO: H-275
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Machine Tools
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

- N.B
- i. Solve any three questions from each section.
 - ii. Figures to the right indicate full marks.
 - iii. Add suitable sketches, wherever required.

Section A

- | | | |
|-----|---|----|
| Q.1 | a) Differentiate between orthogonal & oblique cutting. What is the utility of orthogonal cutting? | 07 |
| | b) Why tools fail during cutting? Explain giving reasons of tool wear. | 06 |
| Q.2 | a) What are the basic parts of centre lathe? Discuss the function of head stock. | 07 |
| | b) Name different methods of taper turning done on a centre lathe drawing simple sketch. | 06 |
| Q.3 | a) Name & describe the principal parts of a vertical milling machine. | 08 |
| | b) Classify milling cutters. State material and features of each. | 05 |
| Q.4 | a) List the names of various collet chucks. Describe one in brief. | 08 |
| | b) Differentiate between a planner & a shaper. | 05 |
| Q.5 | a) Describe the main parts of a slotting machine. Describe at least three of them. | 07 |
| | b) Describe the principle of quick return mechanism as used in shapers. | 07 |

Section B

- | | | |
|-----|---|----|
| Q.6 | a) What are the different methods of production of gears? Describe any one. | 06 |
| | b) Sketch and describe in brief a radial drilling machine. | 07 |

- Q.7 What are different work holding devices in drilling machine? Explain. 13
- Q.8 a) Describe in brief the various types of operations that can be performed by a vertical boring machine. 07
- b) What is centreless grinding? Explain it in detail. 06
- Q.9 a) How a grinding wheel is selected? Outline various factors that influence its selection. 06
- b) Sketch block diagram of any one broaching machine. Describe the machine in brief. 07
- Q.10 a) Describe principle & working of abrasive jet machining. 05
- b) Explain electro discharge machining (EDM) in detail. 05
- c) Differentiate between preventive and predictive maintenance. 04

Total No. of Printed Pages:02

SUBJECT CODE NO:- H-276
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Production Processes-II
(OLD)

[Time: Three Hours]**[Max. Marks: 80]**

- N.B Please check whether you have got the right question paper.
- i) Q. No 1 from section A and Q. No 6 from section B are compulsory.
 - ii) Attempt any two questions from Q. No 2 to Q. No 5 in section A and any two questions from Q. No 7 to Q. No 10 in section B.
 - iii) Figures to three right indicate full marks.
 - iv) Assume suitable data whenever necessary.

Section A

- | | | |
|-----|---|----------|
| Q.1 | Attempt any five questions from the following:- | 10 |
| | <ol style="list-style-type: none"> a) What is CIM? b) What are the benefits of CNC machine? c) What are the types of chips in machining process? d) What is machinability? e) Enlist the workpiece holding devices in Lathe machine. f) What are the types of Lathe Machines? g) Enlist the milling cutters. h) What is chip breaker? i) Explain Gear Hobbing purpose. j) Explain the role of Automation in machine tool. | |
| Q.2 | <ol style="list-style-type: none"> a) What are the various types of cutting tools used in machine tools? b) What is orthogonal and oblique cutting? | 08
07 |
| Q.3 | <ol style="list-style-type: none"> a) What is the effect of cutting speed, feed rate and depth of cut on Lathe machine for tool life? b) Enlist tool holding device for Lath Machine. Explain any two with neat sketches. | 08
07 |
| Q.4 | <ol style="list-style-type: none"> a) What are the various Lathe Accessories? b) Explain the construction and working of universal Milling Machine. | 08
07 |
| Q.5 | <ol style="list-style-type: none"> a) What are the various operations performed on milling machines? b) What are the various types of workpiece holding devices for Milling Machine | 08
07 |

Section B

- Q.6 Solve any Five:- 10
- a) What are the functions of planner?
 - b) What are the operations performed on slotter machine?
 - c) How selection of grinding wheel done?
 - d) What are the functions of broach?
 - e) What are boring bars?
 - f) What are grit and grades?
 - g) What are the types of grinding machine?
 - h) Enlist work holding devices for grinding machine.
 - i) What is the need of non-traditional machining?
 - j) What is chemical machining?
-
- Q.7 08
- a) What are the various operations performed on shaper machine?
- 07
- b) Explain with neat sketch slotter Machine.
-
- Q.8 08
- a) What is surface Grinder? Explain any one horizontal surface grinder.
- 07
- b) Explain sensitive drilling machine.
-
- Q.9 08
- a) With neat sketch explain horizontal broaching machine.
- 07
- b) What is Laser Beam Machining ? Give it's advantages and applications.
-
- Q.10 08
- a) Explain with neat sketch Abrasive Jet Machining.
- 07
- b) What is EDM process? State applications of EDM process.

Total No. of Printed Pages:02

SUBJECT CODE NO: H-359
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech. / Prod)
Thermodynamics-I
(OLD)

[Time: Three Hours]

[Max.Marks:80]

N.B Please check whether you have got the right question paper.

- 1) Q. No. 1 and Q. No. 6 are compulsory.
 2) Solve any two questions from remaining questions in each section.
 3) Use of steam table / mollier diagram is allowed.
 4) Assume suitable data, if required.
 5) Figure to the right indicates full marks.

SECTION – A

- Q.1 Solve any five 10
- Define control – volume and control – surface with help of neat sketch.
 - What are the assumptions made in S.F.E.E analysis?
 - State “Clausius” statement of IInd Law of thermodynamics.
 - What do you mean by term “Entropy”?
 - Define the term “availability”.
 - What are the assumptions made in the operation of Carnot cycle?
 - A heat engine receives heat at a rate of 1500 KJ/ min and gives an output of 8.2 kW. Determine i) The thermal efficiency, ii) The rate of heat rejection.
- Q.2 09
- A hydraulic turbine is supplied with $25 \text{ m}^3/\text{sec}$ of water. At the turbine inlet, the water is at 5 bar and 25°C with an elevation above datum of 100 meters and a flow velocity of 1 m/s. At the turbine exit. The water is at 1.2 bar and 25.1°C with zero elevation and a flow velocity of 11 m/s. The turbine loses 5 Joule of heat per Kg of water flowing through it. Assuming that water is an incompressible fluid with specific heat of 4.178 KJ/ Kg K. Determine i) Change in Potential Energy, ii) The change in internal energy and iii) the power output in MW.
 - Write down the general energy equation for steady flow system and simplify when applied for the following systems: i) Steam Nozzle, ii) Centrifugal water pump. 06
- Q.3 08
- A fish freezing plant receives 40 tons of refrigeration. The freezing temperature is -35°C while the ambient temperature is 30°C . If the performance of the plant is 20% of the theoretical reversed Carnot cycle working within the same temperature limits. Calculate power required. Given: 1 ton of refrigeration = 210 KJ/ min.
 - Prove the equivalence of Kelvin Plank and Clausius statements of second law of thermodynamics. 07

- Q.4 a) State and prove “Clausius Inequality”. 08
 b) Explain the terms dead state, useful work and maximum work. 07
- Q.5 Write short note (any three): 15
 a) Carnot cycle
 b) Flow work and energy of a flowing fluid
 c) Entropy principle
 d) Performance of heat engines and reversed heat engines.

SECTION – B

- Q.6 Solve any five. 10
 a) Draw Otto cycle on P-V and T-S Diagram.
 b) Write limitations of Carnot cycle.
 c) Write a short note on mean effective pressure.
 d) Calculate the dryness fraction of steam which has 1.5 kg of water in suspension with 55 kg of steam.
 e) Define pure substance. State its examples.
 f) Define fuel. State its types.
 g) What is calorific value? State its types.
- Q.7 a) An engine of 250 mm bore and 375 mm stroke works on Otto cycle. The clearance volume is 0.00263 m^3 . The initial pressure and temperature are 1 bar and 50°C . If the maximum pressure is limited to 25 bar, find the following: i) the air standard efficiency of the cycle, ii) the mean effective pressure for the cycle. Assume the ideal conditions. 09
 b) Derive and expression for mean effective pressure of Diesel cycle. 06
- Q.8 a) With neat sketch explain the construction and working of throttling calorimeter. 06
 b) A pressure cooker contains 1.5 kg of saturated steam at 5 bar. Find the quantity of heat which must be rejected so as to reduce the quality to 60% dry. Determine the pressure and temperature of the steam at new state. 09
- Q.9 a) Write a short note on Bomb calorimeter. 08
 b) Explain flue gas analysis by using Orast apparatus. 07
- Q.10 Write short note (any three): 15
 a) Ericsson cycle
 b) Triple point
 c) Solid fuels
 d) Pure substance

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-360
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mechanical) (CGPA)
Thermodynamics-I
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

- N.B Please check whether you have got the right question paper.
- (i) Question number 1 & 6 are compulsory from Section A & B.
 - (ii) Solve any two from remaining questions in each section A&B.
 - (iii) Use of Steam table permitted.
 - (iv) Assume suitable data, if required.

Section A

- | | | |
|-----|--|--------------|
| Q.1 | Solve any five | 10 |
| | <ol style="list-style-type: none"> (i) Represent isothermal compression process on P-V & T-S diagram. (ii) prove that COP of heat pump is equal to COP of refrigerator plus one (iii) Modify SFEE for adiabatic air compressor. (iv) State limitations of first law of thermodynamics. (v) State first law of thermodynamics (vi) Explain clausius statement of second law. (vii) Define available and unavailable energy. | |
| Q.2 | <ol style="list-style-type: none"> (a) modify SFEE for <ol style="list-style-type: none"> (i) Nozzle (ii) Boiler (iii) Throttle valve (b) Steam enters a turbine at a pressure of 10 bar and 300° C with a velocity of 50 m/s. The steam leaves turbine at 0.15 MPa and with a velocity of 200 m/s. Assuming isentropic process, determine work done per kg of steam flowing through the turbine. | 06

09 |
| Q.3 | <p>A reversible heat engine operates between two reservoir at 700°C & 50°C. The engine drives Carnot refrigerator which operates between 50°C and – 25°C. Heat transfer to engine is 25000 KJ and net workout of combined engine refrigerator plant is 400 KJ. Determine</p> <ol style="list-style-type: none"> (i) net heat transfer to reservoir at 50°C. (ii) Also calculate net heat transfer to reservoir at 50°C by considering performance of engine & refrigerator 40% of maximum possible values. | 15 |
| Q.4 | <ol style="list-style-type: none"> (a) Explain clausius theorem. (b) Explain principle of increase in entropy of universe. | 07
08 |

- Q.5 Short note on (Any three) 15
- (i) Thermodynamic temperature scale
 - (ii) Carnot theorem
 - (iii) Heat engine & Heat pump
 - (iv) SFEE

Section B

- Q.6 Solve any five 10
- (i) Explain latent heat
 - (ii) Draw Otto cycle on P-V. & T-S. diagram.
 - (iii) Define mean effective pressure.
 - (iv) Explain h-s diagram
 - (v) Define HCV & LCV
 - (vi) List limitations of Carnot cycle
 - (vii) What is dryness fraction?

- Q.7 (a) Derive expression for ideal efficiency of dual cycle 10
 (b) An engine working on Otto cycle has efficiency of 40% & initial temp is 30°C. Determine 05
- (i) Compression ratio
 - (ii) Temperature at the end of isentropic compression.

- Q.8 Steam at a pressure of 20 bar and 350°C expands adiabatically to a pressure of 1 bar till the steam is dry saturated at the end of expansion. Find 15
- (i) Change of internal energy
 - (ii) Workdone
 - (iii) Change of entropy.

- Q.9 (a) Explain HCV and LCV 03
 (b) % composition by mass of coal is C=90%, H₂=4%, S=1% and Ash=5%. Calculate minimum air required. If 50% excess air is supplied, find mass of dry flue gases per kg of fuel and % composition of flue gases by volume. 12

- Q.10 Short notes on (Any three) 15
- (i) Separating & Throttling calorimeter
 - (ii) Diesel Cycle
 - (iii) Compare Otto, Diesel and dual cycle for same maximum temperature & pressure
 - (iv) Constant pressure cycle.

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-393
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Production Processes-I
(OLD)

[Time: Three Hours]

[Max.Marks:80]

- N.B Please check whether you have got the right question paper.
- 1) Question No.1 from Section A and Q. No.6 from Section B are compulsory.
 - 2) Attempt any two questions from Q. No.2 to Q. No.5 in Section A and any two questions.
 - 3) Figures to the right indicate full marks.
 - 4) Assume suitable data whenever necessary.

Section A

- | | | |
|-----|---|----|
| Q.1 | 1) Attempt any five questions from the following | 10 |
| | <ol style="list-style-type: none"> (a) What is a binder used in molding sand? List the different binders used in sand molding? (b) What are the inspections methods of casting? (c) Why the sprue should be tapered? (d) What is the difference between cold and hot working? (e) What is the functions of runner in casting? (f) What is embossing? (g) Enlist the allowances that are normally provided in forging. (h) What are the types of dies? (i) Explain notching and parting off operations for sheet metal (j) What are the functions of flywheel? | |
| Q.2 | (a) What are the different types of patterns used in molding? Explain any three with neat sketches. | 08 |
| | (b) What are the essential properties of sand molding sands? Enlist types of sand. | 07 |
| Q.3 | (a) Explain the casting defects with its causes and remedies. | 08 |
| | (b) What is permanent mold casting process? Give its applications. | 07 |
| Q.4 | (a) What is Extrusion ? Explain forward and backward extrusion | 08 |
| | (b) Explain wire and tube drawing process. | 07 |
| Q.5 | (a) Explain hydraulic power press with neat sketch. Give its advantages | 07 |
| | (b) Explain the following sheet metal operations | 08 |
| | <ol style="list-style-type: none"> (i) Bending (ii) Slitting (iii) Punching (iv) Perforating | |

Section B

- Q.6 Solve any five of the following:- 10
- (a) What are the various types of plastic moulding dies?
 - (b) How casting of plastic done?
 - (c) Give the classification of welding process.
 - (d) How gas cutting is done?
 - (e) What is the purpose for inspection of weld?
 - (f) What is the function of flux covering to the welding electrodes?
 - (g) Enlist Safety Equipment for Arc Welding process.
 - (h) What is the purpose of surface treatment?
 - (i) What is the role of shielding gas during Welding?
 - (j) What is metal spraying?
- Q.7 (a) What is injection moulding? Give its applications. 08
 (b) Explain Blow Moulding with neat sketch. Give its advantages and limitations. 07
- Q.8 (a) What is Oxy Acetylene type gas welding? Give its applications. 08
 (b) With neat sketch explain submerged Arc Welding. 07
- Q.9 (a) What is friction Welding? Give applications. 08
 (b) Explain with neat sketch- Resistance seam welding process. 07
- Q.10 (a) How metallic coating done to the surface of metal? 08
 (b) What is LASER Beam Welding? Explain giving example Laser Beam Welding Process. 07

Total No. of Printed Pages:2

SUBJECT CODE NO:- H-394
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mechanical) (CGPA)
Production Processes
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

- N.B Please check whether you have got the right question paper.
1. Q. No. 01 and 06 are compulsory.
 2. Attempt any two from remaining questions from Section A & B.
 3. Draw neat labeled sketches whenever necessary and assume suitable data whenever necessary.

Section A

- | | | |
|-----|--|----|
| Q.1 | Solve “any five” from the following. | 10 |
| | (a) What are the main constituents of moulding sand. | |
| | (b) Define hot working and cold working process. | |
| | (c) What are the common allowances provided to pattern? | |
| | (d) List the operations carried out in sheet metal working. | |
| | (e) State the advantages of centrifugal casting process. | |
| | (f) Explain in short, punching and blanking operation. | |
| | (g) Name the types of rolling mills used for rolling. | |
| Q.2 | A) Explain cupola furnace in detail with neat sketch. | 08 |
| | B) Explain various casting defects in detail. | 07 |
| Q.3 | A) Explain Roll bending process with a neat sketch. Also state its applications. | 08 |
| | B) Differentiate between Hot working process and cold working process in detail. | 07 |
| Q.4 | A) With a neat sketch explain centrifugal casting. State its applications. | 08 |
| | B) Explain the process of production of seamless pipes. | 07 |
| Q.5 | Write short notes on any three | 15 |
| | A) Rotary Swaging | |
| | B) Drop Forging | |
| | C) Gating system | |
| | D) Press brake. | |
| | E) Bending operation. | |

Section B

- Q.6 Solve “any five” from the following. 10
- (a) Name the different defects in welding.
 - (b) Define metal spraying and polishing.
 - (c) What is the purpose of Surface treatment?
 - (d) Define thermoplastic and thermosetting plastic.
 - (e) Why filler materials are used in welding process?
 - (f) List different types of coatings.
 - (g) What are laminated plastics ?
 - (h) Name different weld testing methods.
- Q.7 A) Describe with neat sketch blow moulding, stating their advantages and applications. 07
 B) With a neat sketch explain the working principle of Extrusion moulding process. 08
- Q.8 A) Discuss with the help of neat sketch TIG welding. State its advantages and applications. 08
 B) Explain in detail oxy-acetylene welding process with neat sketch. State its advantages and limitations. 07
- Q.9 A) What are various cleaning processes? Explain mechanical cleaning process. 07
 B) What is powder coating? List down the advantages and limitations of powder coating. 08
- Q.10 Write short notes on any three. 15
- A) Metal Spraying.
 - B) Defects in welding.
 - C) Electron beam welding.
 - D) Application of Plastic industry
 - E) Callendaring.

Total No. of Printed Pages:4

SUBJECT CODE NO:- H-429
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mechanical) (CGPA)
Strength of Material
(REVISED)

[Time: Three Hours]

[Max.Marks:80]

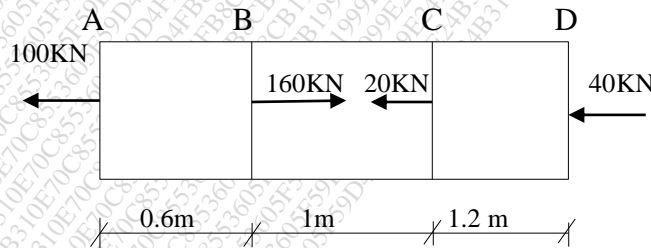
- N.B
- Please check whether you have got the right question paper.
- i) Question No.1 & 6 are compulsory. Attempt any two from remaining from each section.
 - ii) Figures to right indicate full marks.
 - iii) Assume suitable data if necessary.

Section A

Q.1 Attempt any Five 10

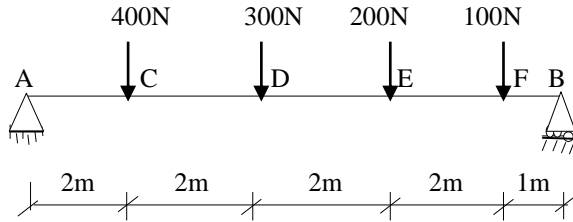
- a. State Hook's law.
- b. Explain modulus of Elasticity.
- c. Explain volumetric stress and strain.
- d. Explain point of contra flexure.
- e. State and explain types of loading.
- f. Define pure bending.
- g. State bending equation.
- h. Explain moment of resistance.

Q.2 a) A brass bar having cross-sectional area of 1000 mm^2 is subjected to axial forces as shown in figure. Find the total elongation of bar. Modulus of Elasticity of brass = $100 \times 10^3 \text{ N/mm}^2$ 07



b) A composite bar having copper rod 36mm dia is rigidly attached to both the ends inside of steel tube, which is 50 mm in external dia. and thickness of 5mm. The composite bar is subjected to an axial pull of 100 K N. Find stresses induced in each metal. Take $E_s=200 \text{ KN/mm}^2$ $E_c = 110 \text{ KN/mm}^2$ 08

Q.3 Draw S.F.D and B.M.D. for simply supported beam as shown in figure 15

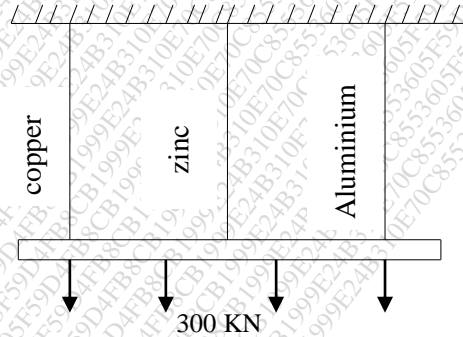


Q.4 A T section having flange 160mm wide and 20mm thick and web 180mm x 20mm carries a UDL of 50 KN/m over simply supported span of 8m. Calculate the maximum tensile and compressive bending stresses. 15

Q.5 a) Derive the shear stress equation 08

$$z = \frac{S\bar{A}\bar{Y}}{bl}$$

b) Three bars made of copper, zinc and aluminium are of equal length and having cross-section 500mm², 750 mm², 1000mm² respectively. They are rigidly connected at their ends. If this composite member is subjected to a longitudinal pull of 300 KN, estimate the proportion of load carried by each rod and induced stresses. Take the value of E for Copper = 1.3 x 10⁵ N/mm², For zinc=1.0 x 10⁵ N/mm² and for aluminium = 0.8 x 10⁵ N/mm². P=300 KN. 07

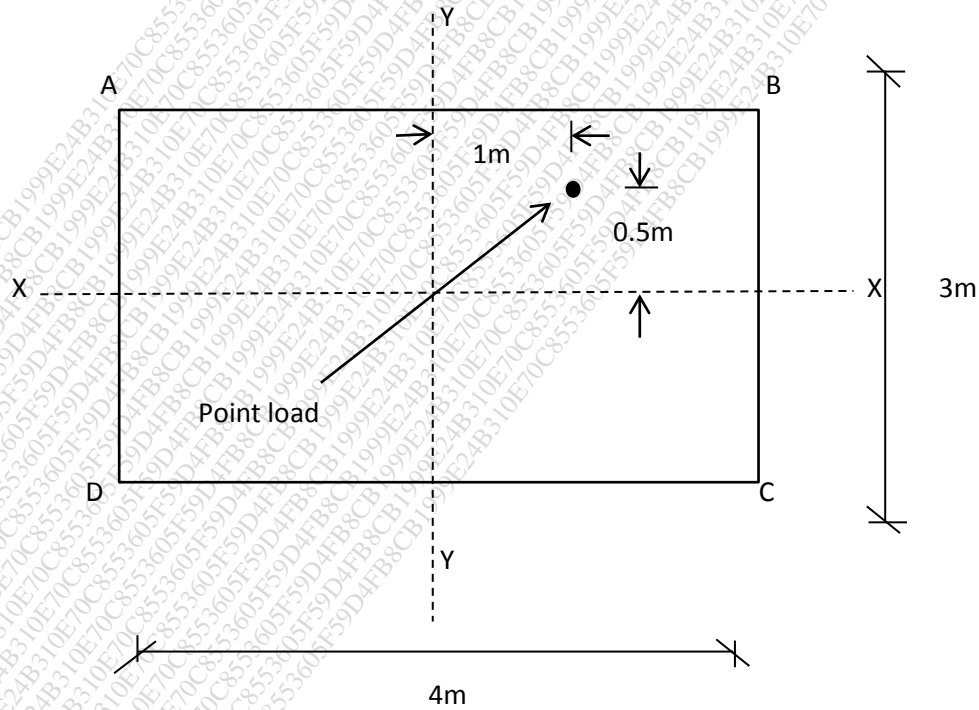


Section B

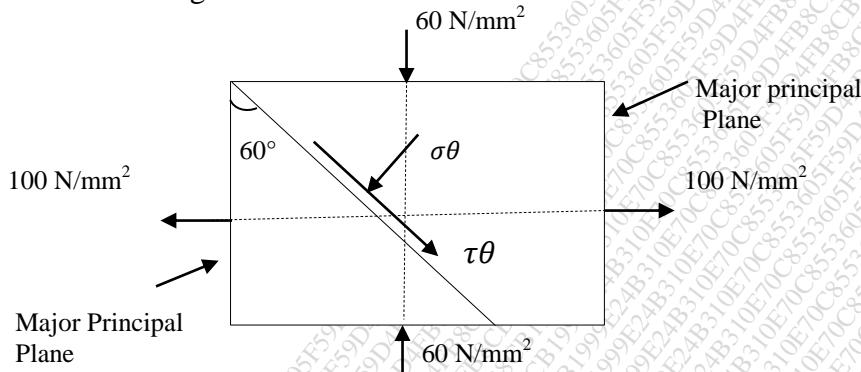
Q.6 Attempt any Five 10

- (a) Define Direct and Bending Stresses.
- (b) What are the assumptions in theory of torsion?
- (c) What is angle of twist?
- (d) Explain Mohr's circle with Diagram.
- (e) State change in dimensions of thin cylindrical shells due to an internal pressure.
- (f) Explain strain Energy.
- (g) Define Proof Resilience.
- (h) Define circumferential stresses.

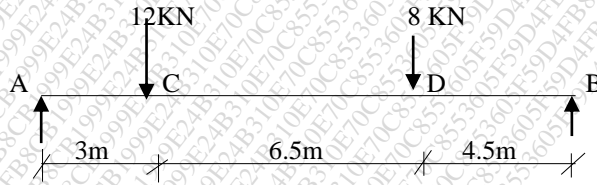
- Q.7 (a) Find the maximum torque that can be safely applied to a shaft of 80mm diameter. The permissible angle of twist is 1.5° in length of 5m and shear stress not be exceed 42 MPa, Take $G=84$ GPa. 08
- (b) A vertical steel rod of uniform diameter 30mm & 2.5 m long, subjected to a load of 2 KN dropping from 20mm on a collar at a lower end of bar. If top end of bar is fixed, Calculate. 07
- (1) Instantaneous stress produced
- (2) Strain Energy
- Take $E= 2 \times 10^5$ N/mm²
- Q.8 (a) A cylindrical air receiver for a compressor is 2m in internal diameter and made of plates 12mm thick. If the hoop stress is not to exceed 90 N/mm² and the axial stress is not exceed 60 N/mm², Find the maximum safe air pressure. 08
- (b) A masonry pier of 3m x 4m support a vertical load of 80 KN as shown in figure. Find the stresses developed at each corner of pier. 07



Q.9 At a point in strained material, the principal stresses are 100 N/mm^2 tensile and 60 N/mm^2 compressive. Find the normal shear stresses across a plane passing through the point making an angle of 60° to the major principal plane. Find the plane across which the normal stress is zero. What will be the shear stress along which the normal stress is zero?



Q.10 A Horizontal Steel girder having uniform cross-section is 14m long and is simply supported at its ends. It carries two concentrated loads as shown in figure. Calculate the deflections of the beam under the Loads C and D. Take $E=200 \text{ GPa}$ and $I = 160 \times 10^6 \text{ mm}^4$



Total No. of Printed Pages:3

SUBJECT CODE NO:- H-428
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Strength of Material
(OLD)

[Time: Three Hours]

[Max.Marks:80]

Please check whether you have got the right question paper.

N.B

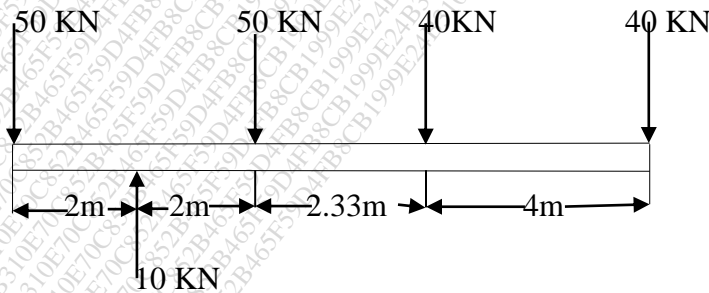
- i) Q. No.1 & Q. No.6 are compulsory.
- ii) Attempt Any two questions from the remaining questions in each section.
- iii) Assume suitable Data, if necessary.

Section A

Q.1 Attempt any Five. 10

1. Define compressive Stress.
2. Define Factor of Safety
3. Define shear stress.
4. Draw Stress Strain diagram for Brittle material.
5. Define Thermal Stress.
6. Define Poisson's Ratio.
7. Define Neutral Axis
8. Define Lateral Strain.

Q.2 a) Define Point of Contraflexure. 03
 b) Draw S.F.D. & B.M.D & locate maximum bending moment for a beam. 12



Q.3 a) Explain Theory of simple bending. 03
 b) A Rectangular Beam 300mm. Deep is simply supported over a span of 4m. What is uniformly distributed load per metre, if bending stress should not exceed 120 N/mm^2 , $I = 8 \times 10^6 \text{ mm}^4$ 12

- Q.4 a) Explain shear stress distribution for a rectangular section. 05
 b) A Timber beam of Rectangular section is simply supported at the ends & carries a point load at 10
 center of beam the maximum bending stress is 12 MPa & Maximum shear stress is 1 MPa, Find
 the ratio of the span to the depth

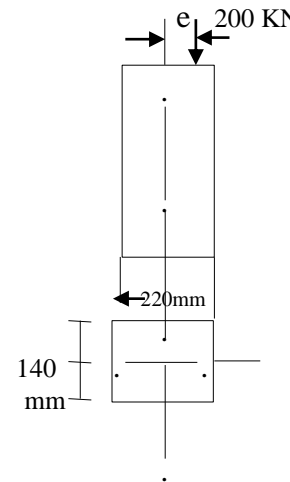
- Q.5 (a) Explain Thermal Stresses in composite Bars. 05
 (b) A steel tube of 30mm External Diameter and 20mm Internal diameter encloses a copper Rod 10
 15mm diameter to which it is joined in each end. If at temperature of 12°C, there is no
 longitudinal stress, Calculate the stresses in the Rod when temperature is raised to 220°C.
 Take $E(\text{Steel}) = 2.1 \times 10^5 \text{ N/mm}^2$
 $\alpha (\text{Steel}) = 11 \times 10^{-6} / ^\circ\text{C}$
 $E(\text{Copper}) = 1 \times 10^5 \text{ N/mm}^2$
 $\alpha (\text{Copper}) = 18 \times 10^{-6} / ^\circ\text{C}$

Section B

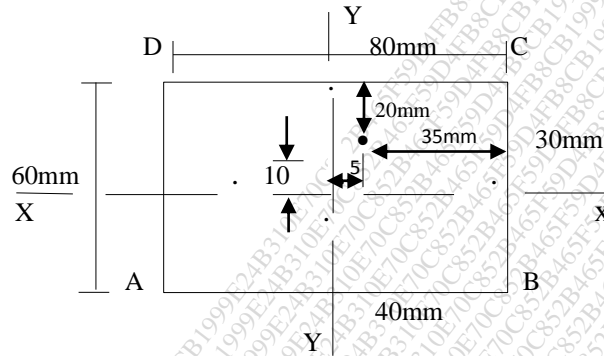
- Q.6 Attempt any five 10

- i) Define Strain Energy
- ii) Define Angle of Twist
- iii) Define Deflection of Beam
- iv) Assumptions of Theory of Torsion.
- v) Define Hoop Stress.
- vi) Define maximum Shear Stress.
- vii) Define Kernel Section of column
- viii) What is Mohr's Stress circle.

- Q.7 a) A Rectangular column of width 220mm & Thickness of 140mm carries point load of 200 kN at 08
 an eccentricity of 10mm. Determine the maximum & minimum stresses in section



- b) A short column of Rectangular cross section 80 mm & 60mm carries a Load of 40 KN at a point 20 mm from the longer side & 35 mm from shorter side. Determine maximum compressive & Tensile stresses in the section.



- Q.8 (a) Derive the equation for maximum Torque Transmitted by a circular solid shaft. 05
 (b) Two shafts of the same material and same lengths are subjected to the same Torque if the first shaft is a solid circular shaft & the second shaft is a hollow shaft of circular cross section, whose internal diameter is 2/3 of the outside diameter & maximum shear stress developed in the shafts is same, compare weights. 10
- Q.9 (a) Derive an expression for circumferential stress & Longitudinal stress for thin cylinder. 08
 (b) A cylindrical shell 90 cm Long & 20 cm internal Diameter having thickness of metal 8mm is filled with fluid at atmospheric pressure. If an additional 20 cm³ of Fluid is pumped into the cylinder, calculate pressure exerted by Fluid & Hoop Stress. $E=2.1 \times 10^5$ MPa $\mu=0.3$ 07
- Q.10 Write Short Notes 15

- 1) Strain Energy
- 2) Stresses in thin cylinder shell
- 3) Maculay's method for finding deflection.

Total No. of Printed Pages:3

SUBJECT CODE NO:- H-168
FACULTY OF ENGINEERING AND TECHNOLOGY
S.E. (Mech/Prod)
Theory of Machines - I
(REVISED)

[Time: Three Hours]

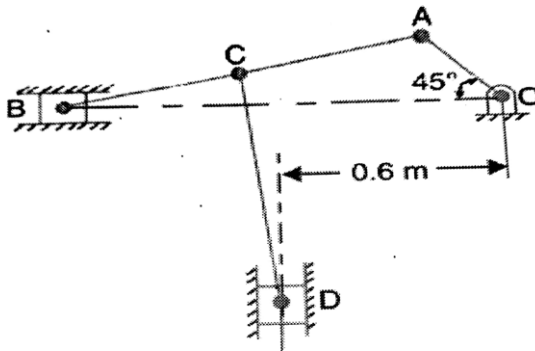
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Please check whether you have got the right question paper.

- N.B
1. Q.No.1 and Q.No.6 are compulsory.
 2. Attempt any two questions out of remaining from each section.
 3. Figures to the right indicate full marks.
 4. Draw neat sketches wherever necessary.
 5. Assume suitable data wherever necessary.

Section A

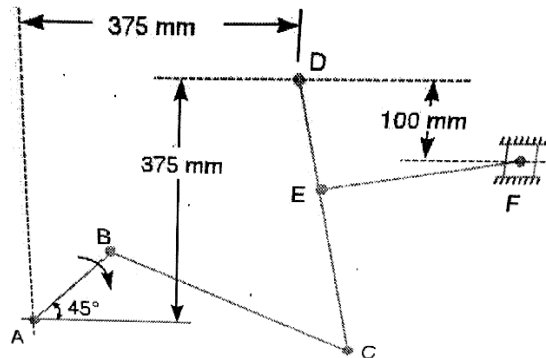
- Q.1 Attempt any five: 10
- a) Define Rubbing Velocity.
 - b) Define higher pair & Lower pair.
 - c) Write classification of kinematic pair.
 - d) Degrees of freedom.
 - e) Define Kutzbach criterion.
 - f) Define Space centrode & body centrode.
 - g) State Kennedy theorem.
 - h) What is Coriolis component of acceleration
 - i) What is successfully constrained Motion?
 - j) Define Radial component of acceleration.
- Q.2 Length of various links of a mechanism as shown in fig. $OA = 0.3m$, $AB = 1m$, $CD = 0.8m$, and $AC = CB$. Crank OA rotates at 60 rpm. Find. 15
- 1) Velocity of slider D and angular velocity of link CD . Use I-Centre Method.



Q.3 The mechanism, as shown in fig. has the dimensions of various links as follows: 15
 $AB = DE = 150 \text{ mm}; BC = CD = 450 \text{ mm}, ; EF = 375 \text{ mm}$. The crank AB makes an angle of 45° with the horizontal and rotates about A in the clockwise direction at a uniform speed of 120 r.p.m. determine:

1. Velocity of the block F,
2. Angular velocity of DC, and
3. Rubbing speed at the pin C which is 50 mm in diameter.

Use relative velocity method.

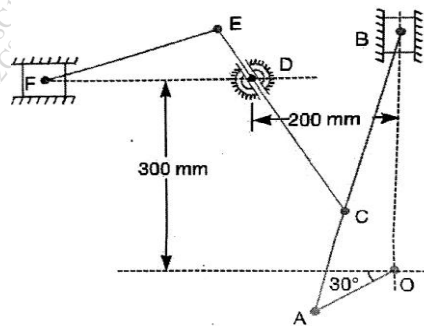


Q.4 a) In an reciprocating engine mechanism crank length is 250mm, connecting rod length is 950 mm. crank rotates at 200 r.p.m clockwise which makes an angle 45° with IDC. Find 10
 1) Velocity and acceleration of piston
 2) Angular velocity and angular acceleration of connecting rod.
 (Use Klein's Construction Method)

b) Explain with neat sketch working of whit worth quick return mechanism. 05

Q.5 Fig. shows a mechanism in which the crank OA, 100 mm long rotates clockwise about O at 130 r.p.m. the connecting rod AB is 400 mm long. The rod CE, 350 mm long, is attached to AB at C, 150 mm from A. this rod slides in a slot in a trunnion at D. the end E is connected by a link EF, 300 mm long, to the horizontally moving slider F. 15

- 1) Find velocity of slider F.
- 2) Acceleration of slider F.
- 3) Angular acceleration of EF.



Section B

- Q.6 Attempt any five: 10
- Define Necessity of balancing.
 - Difference between dynamometer and brake.
 - Explain Inside cylinder locomotive.
 - Define Pressure angle.
 - Define Self Energizing.
 - Define Centrifugal force and its formula.
 - Define Blow Hammer.
 - Define Swaying Couple.
 - Define transmissions dynamometer.
 - Write classification of brake.
- Q.7 A cam is to be designed for a knife edge follower with following data: cam lift = 40mm during 90° rotation of cam rotation with uniform velocity. Dwell for next 30°. During next 120° of cam rotation, the follower returns to its original position with SHM. Draw the profile of the cam when the line of stroke of the follower passes through the center of cam shaft. The radius of the cam is 40mm. 15
- Q.8
- Explain with neat sketch rope brake dynamometer. 03
 - A band brake acts on the 3/4th of circumference of a drum of 460 mm diameter which is keyed to the shaft. The band brake provides a braking torque of 250 N-m. one end of the band is attached to a fulcrum pin of the lever and the other end to a pin 100 mm from the fulcrum. If the operating force is applied at 510 mm from the fulcrum and the coefficient of friction is 0.25, find the operating force when the drum rotates in the
 - Anticlockwise direction, and
 - Clockwise direction. 12
- Q.9 Four masses A, B, C and D revolve at equal radii and are equally spaced along a shaft. The mass B is 7kg and radii of C & D makes an angle 90° & 240° respectively with the radius of B. find magnitude of masses A, C, D and the angular position of A so that system is to be in completely balanced. 15
- Q.10 An inside cylinder locomotive has its cylinder center lines 0.7 m apart and has a stroke of 0.6 m. the rotating masses per cylinder are equivalent to 140 kg at the crank pin, and the reciprocating masses per cylinder to 170 kg. The wheel center lines are 1.5 m apart. The cranks are at right angles. The whole of the rotating and 2/3 of the reciprocating masses are to be balanced by masses placed at a radius of 0.5 m. find the magnitude and direction of the balancing masses. Find magnitude of hammer blow, variation of tractive effort the magnitude of swaying couple at a crank speed of 250 r.p.m. 15