Code No: **R22A0305**
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, June/July 2024
Materials Engineering
(ME)

Roll No										

Time: 3 hours   **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions,
Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A (10 Marks)
Write all answers of this part at one place

1	A	Define space lattice and unit cell.	**[1M]**
	B	What is solid solution?	**[1M]**
	C	Explain what is a eutectic temperature?	**[1M]**
	D	What is eutectoid reaction?	**[1M]**
	E	What is the effect of silicon in cast iron?	**[1M]**
	F	Why is 5% tin bronze stronger than 5% Zn brass?	**[1M]**
	G	What is the maximum solubility of carbon in iron? Why? What will happen to the carbon if it exceeds the maximum solubility limit?	**[1M]**
	H	Why are metals mostly ductile and ceramics are brittle at room temperature?	**[1M]**
	I	What are whiskers reinforced composites.	**[1M]**
	J	What are the advantages and disadvantages of pultrusion process?	**[1M]**

PART-B (50 Marks)
SECTION-I

2	A	Derive the relation between atomic radius and lattice parameter for FCC materials and calculate its packing factor.	**[5M]**
	B	What are the Miller indices of a plane in the cubic structure that intersect the x-axis at ½, y-axis at 1 and is perpendicular to xy-plane?	**[5M]**

OR

3	A	What do you mean by intermediate alloy phase? Explain any one type of intermediate alloy phase with suitable examples.	**[5M]**
	B	Explain about Hume Rothers rules.	**[5M]**

SECTION-II

4	A	Draw and explain the cooling curve for Alloy-solid solution type.	**[5M]**
	B	Explain the Eutectic system (b) Peritectoid system	**[5M]**

OR

5	A	Draw and explain Fe – Fe$_3$C diagram and label all important points, lines, and phases in it.	**[5M]**
	B	The maximum solubility of carbon in y-iron is 2% (interstitial void	**[5M]**

space is 26%) that of y-iron is 0.025 (interstitial void space is 32%). Explain the reasons for the above behaviour with neat sketches.

SECTION-III

6	A	Briefly explain the effect of combined carbon and free carbon.	**[5M]**
	B	State the difference between hypoeutectoid, eutectoid and hypereutectoid steels.	**[5M]**

OR

7	A	State the difference between brass and bronze.	**[5M]**
	B	Write short notes on Gun metal and Cartridge brass.	**[5M]**

SECTION-IV

8	A	Write short on Carbonitriding and Age hardening.	**[5M]**
	B	Define hardenability. Describe the end-quench test stating its purpose.	**[5M]**

OR

9	A	What are the outstanding properties of glass? State their applications.	**[5M]**
	B	Compare the properties of crystalline ceramics and glass ceramics.	**[5M]**

SECTION-V

10	A	Explain various phases in fibrous composites. Explain their functions.	**[5M]**
	B	Write short notes on Particle reinforced composites.	**[5M]**

OR

11	A	Describe the Continuous pultrusion process with neat sketch.	**[5M]**
	B	Describe the properties and applications of fibre-reinforced polymer.	**[5M]**

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Code No: **R22A0302**
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, June 2024
Engineering Mechanics
(ME)

Roll No										

Time: 3 hours   **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions,
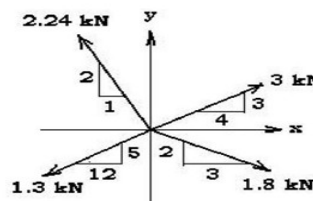Choosing ONE Question from each SECTION and each Question carries 10 marks.
Question carries 10 marks.

***
PART-A (10 Marks)
Write all answers of this PART at one place

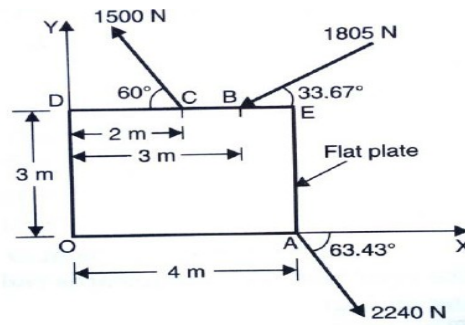|			
1	A	What is a concurrent force system?	**[1M]**
	B	State the parallelogram law of forces.	**[1M]**
	C	What are the types of frames?	**[1M]**
	D	State the laws of static friction.	**[1M]**
	E	Define the term 'center of gravity'.	**[1M]**
	F	State the location of centroid of semicircle arc whose radius is 'r' with a sketch.	**[1M]**
	G	Write an expression for the radius of gyration of an area.	**[1M]**
	H	Define the term 'polar moment of inertia'.	**[1M]**
	I	What is the difference between kinematics and kinetics?	**[1M]**
	J	Illustrate rectilinear motion with one example.	**[1M]**

PART-B (50 Marks)
SECTION-I

2	A	State and prove the law of triangle of forces.	**[5M]**
	B	The body shown in figure is acted on by four forces. Determine the resultant.	**[5M]**

OR

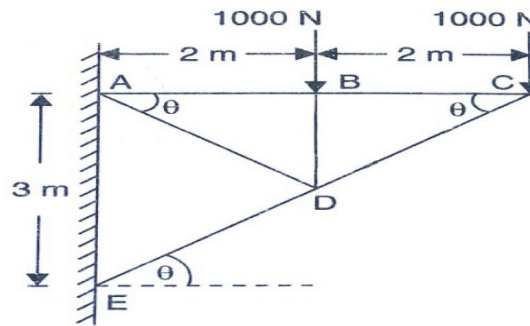|			
3	A	Explain the procedure to find the resultant of concurrent forces of system.	**[5M]**
	B	The following figure shows the coplanar system of forces acting on a flat plate. Determine the magnitude of the resultant and the direction of the resultant.	**[5M]**

SECTION-II

4   **A**   Explain the phenomenon of friction by taking an example of a block placed on a rough surface and derive the friction equation.   **[5M]**

       B   A pull of 60 N inclined at 25^0 to the horizontal plane, is required just to move a body placed on a rough horizontal plane. But the push required to move the body is 75N. If the push is inclined at 25^0 to the horizontal, find the weight of the body and coefficient of friction.   **[5M]**
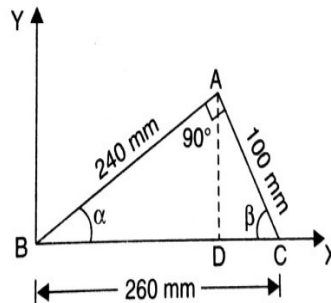
OR

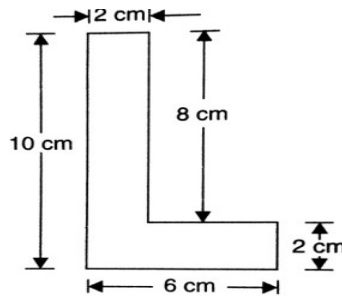**5**   Determine the forces in all the members of a cantilever truss shown in the following fig.   **[10M]**

SECTION-III

6   **A**   Determine the centroid of a rectangle having base b and height h.   **[5M]**

       B   A thin homogeneous wire is bent into a triangular shape ABC such that AB = 240mm, BC = 260mm and AC = 100mm. Locate the Center of Gravity of the wire with respect to coordinate axes. Angle at A is right angle.   **[5M]**
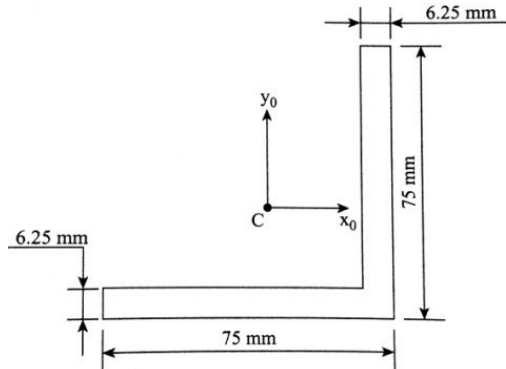

OR

7   **A**   Locate the centroid of a semi-circular disk of radius r.   **[5M]**

       B   Find the centre of gravity of the L-section shown in figure.   **[5M]**

8   **A**   Determine the product of inertia with respect to the x_0 and y_0 axes passing through the centroid.   **[5M]**
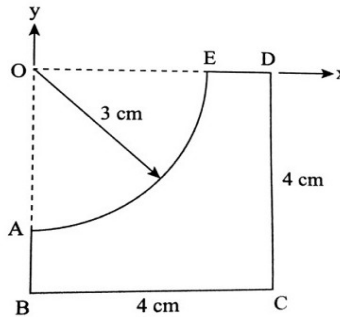

B   Derive the expression for the moment of inertia of a homogeneous right circular cone of mass m, base radius r and altitude h with respect to its geometric axis.   **[5M]**

OR

9   **A**   Find the mass moment of inertia of a hollow cylinder about its axis. The mass of the cylinder is 5kg, inner radius 10cm, outer radius 15cm and height 20cm.   **[5M]**

B   Calculate the polar moment of inertia of the area shown in figure about point O.   **[5M]**

SECTION-V

10   **A**   A fly wheel has its angular speed increased from 20 rad/s to 75 rad/s in 100 seconds. If the diameter of the wheel is 2 m, determine the normal and tangential components of the displacement of the point during this time period.   **[5M]**
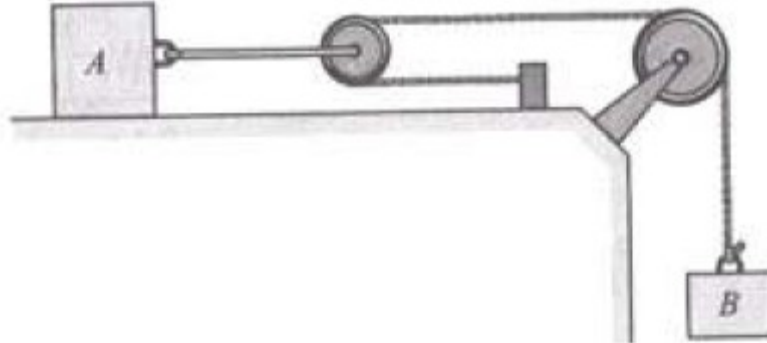
B   A robber's car had a start with an acceleration of 2 m/s². A police vigilant party came after 5 seconds and continued to chase the robber's car with a uniform velocity of 20 m/s. Find the time taken, in which police will overtake the car.   **[5M]**

11   Two blocks A and B of masses 10 kg and 5 kg are connected with cord   **[10M]**
and pulley system as shown in the Figure. Determine the velocity of
each block when the system is started from rest and block B gets
displacement by 2 m. Consider μ_k=0.2 between block A and horizontal
surface.

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R22

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, June/July 2024
Engineering Thermodynamics
(ME)

Roll No										

Time: 3 hours   **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A (10Marks)
Write all answers of this part at one place)

1	A	What do you understand by point function?	**[1M]**
	B	What is irreversible process?	**[1M]**
	C	Define heat pump.	**[1M]**
	D	Define entropy.	**[1M]**
	E	What do you mean by a pure substance?	**[1M]**
	F	Define critical point.	**[1M]**
	G	Define Relative humidity.	**[1M]**
	H	Define Volume fraction.	**[1M]**
	I	Draw the P-V diagram of Otto cycle.	**[1M]**
	J	What is an air standard cycle?	**[1M]**

PART-B (50Marks)
SECTION-I

2 A A diesel engine piston which has an area of 45 cm^2 moves 5 cm during part **[5M]** of suction stroke. 300 cm^3 of fresh air is drawn in from the atmosphere. The pressure in the cylinder during suction stroke is 0.9×105 N/m^2 and the atmospheric pressure is 1.013×105 N/m^2. The difference between the suction and atmospheric pressure is accounted for flow resistance in the suction pipe and inlet valve. Find the net work done during the process.

   B Briefly explain the Microscopic approach. **[5M]**

OR

3 A A cylinder contains 1 kg of a certain fluid at an initial pressure of 20 bars. **[5M]** The fluid is allowed to expand reversibly behind a piston according to a law pV^2 = constant until the volume is doubled. The fluid is then cooled reversibly at constant pressure until the piston regains its original position; heat is then supplied reversibly with the piston firmly locked in position until the pressure rises to the original value of 20 bars. Calculate the net work done by the fluid, for an initial volume of 0.05 m^3.

   B Briefly explain Free expansion and Quasi static process. **[5M]**

SECTION-II

4 A State and prove Kelvin-Planck theorem. **[5M]**

   B Two bodies of equal heat capacities C and temperatures T1 and T2 form an **[5M]** adiabatically closed system. What will be the final temperature be if one lets this system come to equilibrium (i) freely; (ii) reversibly.

5	A	Demonstrate, using the second law, that free expansion is irreversible.	[5M]
	B	Air flows through an adiabatic compressor at 2 kg/s. the initial conditions are 1 bar and 310 K and the exit conditions are 7 bar and 560 K. Compute the net rate of availability transfer and irreversibility. Take T_0=298 K.	[5M]

SECTION-III

6	A	Write short notes on "Mollier diagram". Why do isobars on the Mollier diagram diverge from one another?	[5M]
	B	A rigid close tank of volume $3m^3$ contains 5 kg of wet steam at a pressure of 200 kPa. The tank is heated until the steam becomes dry saturated. Determine final pressure and heat transfer to the tank.	[5M]

7	A	Draw and explain a p-T (pressure-temperature) diagram for a pure substance.	[5M]
	B	A steam pressure of holding capacity 4 m^3 contains a mixture of saturated water and saturated steam at 250^0C. The mass of the liquid present is 1 ton. Determine (i) Quality; (ii) Specific Volume; (iii) Specific Enthalpy; (iv) Specific Entropy	[5M]

SECTION-IV

8	A	Explain Daltons law of partial pressures.	[5M]
	B	A mixture of hydrogen (H_2) and oxygen (O_2) is to be made so that the ratio of H_2 to O_2 is 2:1 by volume respectively. Calculate i) the mass of O_2 required ii) volume of the container.	[5M]

9	A	Define the following terms : (i) Saturated air (ii) Dry bulb temperature (iii) Dew point temperature	[5M]
	B	On a particular day the weather forecast states that the dry bulb temperature is 37^0C, while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day.	[5M]

SECTION-V

10	A	Explain the air standard Otto cycle with the help of P-V and T-S diagrams.	[5M]
	B	The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. Determine the pressures and temperatures at all points of the air standard Otto cycle.	[5M]

11	A	Define mean effective pressure and thermal efficiency of an air standard cycle.	[5M]
	B	An engine with 200 mm cylinder diameter and 300 mm stroke works on theoretical Diesel cycle. The initial pressure and temperature of air used are 1 bar and 27°C. The cut-off is 8% of the stroke. Determine Pressures and temperatures at all salient points.	[5M]

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Code No: **R22A0304**
MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, June/July 2024
Fluid Mechanics & Hydraulic Machines
(ME)

Roll No										

Time: 3 hours   **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

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PART-A (10 marks)
Write all answers of this part at one place)

1	A	Define capillarity	**[1M]**
	B	Define kinematic viscosity	**[1M]**
	C	Define irrotational flow	**[1M]**
	D	Define steady and non-steady flow	**[1M]**
	E	Define energy thickness	**[1M]**
	F	Define Pitot tube	**[1M]**
	G	Where is Kaplan turbine used	**[1M]**
	H	Write a short note on surge tank	**[1M]**
	I	How are centrifugal pumps are classified	**[1M]**
	J	Define slip	**[1M]**

PART-B (50 Marks)
SECTION-I

2   A   Define the terms guage pressure, vacuum pressure and absolute pressure. Indicate their relative positions on a chart.   **[5M]**

      B   What is the difference between U-tube differential Manometers and inverted U-tube differential Manometers? Where are they used?   **[5M]**

OR

3   A   Explain briefly the following: (i) Piezometer (ii) U-tube manometer   **[5M]**

      B   The left leg of a U-tube mercury manometer is connected to a pipe-line conveying water, the level of mercury in the leg being 0.6 m below the center of pipe-line, and the right leg is open to atmosphere. The level of mercury in the right leg is 0.45 m above that in the left leg and the space above mercury in the right leg contains Benzene (specific gravity 0.88) to a height of 0.3 m. Find the pressure in the pipe.   **[5M]**

SECTION-II

4   A   Differentiate between: (i) Laminar & turbulent flow (ii) Rotational and irrotational flow.   **[5M]**

      B   The diameters of a pipe at the sections 1-1 and 2-2 are 200 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 m/s, find; (i) Discharge through the pipe (ii) Velocity of water at section 2-2.   **[5M]**

5   A   List the types of fluid flow and types of flow lines.   **[5M]**

    B   The water is flowing through a tapering pipe having diameters 300 mm and 150   **[5M]**
mm at sections 1 and 2 respectively. The discharge through the pipe is 40
litres/sec. The section 1 is 10 m above datum and section 2 is 6 m above datum.
Find the intensity of pressure at section 2 if that at section 1 is 400 KN/m^2.

SECTION-III

6   A   What do you understand by total energy line, hydraulic line, pipes in parallel,   **[5M]**
pipes in series and equivalent pipe? Explain

    B   Oil of absolute viscosity 1.5 poise and density 848.3 kg/m^3 flows through a 30   **[5M]**
cm I.D.pipe. If the head loss in 3000 m length of pipe is 20 m, assuming a
laminar flow, determine (i) the velocity (ii) Reynolds number.

OR

7   A   Enumerate the examples of laminar flow.   **[5M]**

    B   In a pipe of 400 mm diameter and 900 m length an oil of specific gravity 0.8 is   **[5M]**
flowing at the rate of 0.45 m^3/s. Find: (i) Head loss due to friction (ii) Power
required to maintain the flow. Take kinematic viscosity of oil as 0.3 stoke.

SECTION-IV

8   A   Give the comparison between impulse and reaction turbines.   **[5M]**

    B   A jet of water, 85 mm in diameter, issues with a velocity of 40 m/s and   **[5M]**
impinges on a stationary flat plate which destroys its forward motion. Find the
force exerted by the jet on the plate and work done.

OR

9   A   List the functions of a draft tube.   **[5M]**

    B   A Pelton wheel having a mean bucket diameter of 1.2 m is running at 1000   **[5M]**
r.p.m. The net head on the Pelton wheel is 940 m. If the side clearance angle is
15^0 and discharge through the nozzle is 0.12 m^3/s, determine: (i) Power
available at the nozzle (ii) Hydraulic efficiency of the turbine.

SECTION-V

10   A   Explain the term priming related to centrifugal pump. Why priming is necessary   **[5M]**
for a centrifugal pump.

     B   A single – acting reciprocating pump has a diameter (piston) of 100 mm and   **[5M]**
stroke length 200 mm. The length and diameter of the suction pipe are 6.5 m
and 50 mm respectively. If the suction lift of the pump is 3.2 m and separation
occur when pressure in the pump falls below 2.5 m of water absolute and the
manometer reads 763 mm of mercury. Find the maximum speed at which pump
can be run without separation in the suction pipe.

OR

11   A   The diameter of an impeller of a centrifugal pump at inlet and outlet are 300   **[5M]**
mm and 600 mm respectively. The velocity of flow at outlet is 2.5 m/s and
vanes are set back at an angle of 450 at outlet. Determine the minimum starting
speed of the pump if the Manometric efficiency is 75%.

     B   Explain the working principle of reciprocating pump with sketches.   **[5M]**

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R22

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY
(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, June/July 2024
Kinematics of Machinery
(ME)

Roll No									

Time: 3 hours   **Max. Marks: 60**

Note: This question paper contains two parts A and B
Part A is compulsory which carries 10 marks and Answer all questions.
Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer **FIVE** Questions,
Choosing ONE Question from each SECTION and each Question carries 10 marks.
***
PART-A (10 Marks)
Write all answers of this PART at one place

1	A	Differentiate between higher pair and lower pair	**[1M]**
	B	What is the significance of degrees of freedom	**[1M]**
	C	Explain the pantograph	**[1M]**
	D	Why Ackerman steering gear mechanism is preferred to the Davis steering gear mechanism	**[1M]**
	E	What is radial and tangential components of acceleration	**[1M]**
	F	What is Hook's Joint and its types.	**[1M]**
	G	Define cam and follower?	**[1M]**
	H	Distinguish radial and off set followers used in cam mechanism	**[1M]**
	I	Explain the terms: (i) Module, (ii) Pressure angle of toothed gearing	**[1M]**
	J	What is reverted gear train? Where it is used	**[1M]**

PART-B (50 Marks)
SECTION-I

2	A	Explain the different types of constraints motions in Kinematic pairs	**[5M]**
	B	Sketch and describe the four bar chain mechanism. Why it is considered to be the basic chain	**[5M]**

OR

3		The Whitworth quick return motion mechanism has the driving crank 150 mm long. The distance between fixed centres is 100 mm. The line of stroke of the ram passes through the centre of rotation of the slotted lever whose free end is connected to the ram by a connecting link. Find the ratio of time of cutting to time of return	**[10M]**

SECTION-II

4	A	Explain and prove the point on the link traces exact straight line path for any one mechanism	**[5M]**
	B	Sketch explain its working of Watt mechanism	**[5M]**

OR

5	A	Derive the condition for correct steering of an automobile	**[5M]**
	B	The difference between the Ackerman and Davis steering gears	**[5M]**

SECTION-III

6		The crank of a slider crank mechanism rotates clockwise at a constant speed of 300 r.p.m. The crank is 150 mm and the connecting rod is 600 mm long. Determine: 1.Linear velocity and acceleration of the midpoint of the connecting rod, and 2. angular velocity and angular acceleration of the connecting rod, at a crank angle of 45° from inner dead centre	**[10M]**

position

OR

7 **A** Explain why two Hooke's joints are used to transmit motion from the engine to the differential of an automobile. **[5M]**

B Two shafts with an included angle of 160° are connected by a Hooke's joint. The driving shaft runs at a uniform speed of 1500 r.p.m. The driven shaft carries a flywheel of mass 12 kg and 100 mm radius of gyration. Find the maximum angular acceleration of the driven shaft and the maximum torque required **[5M]**

SECTION-IV

8 A cam is to give the following motion to a knife-edged follower:1 . Outstroke during 60° of cam rotation ; 2. Dwell for the next 30° of cam rotation ; 3. Return stroke during next 60° of cam rotation, and 4. Dwell for the remaining 210° of cam rotation. The stroke of the follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the cam shaft **[10M]**

OR

9 **A** Explain with sketches the different types of followers **[5M]**

B A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below :
1. To raise the valve through 50 mm during 120° rotation of the cam ;
2. To keep the valve fully raised through next 30°;
3. To lower the valve during next 60°; and
4. To keep the valve closed during rest of the revolution i.e. 150° ;
The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft **[5M]**

SECTION-V

10 **A** What are the advantages and disadvantages of Involute and Cycloidal Gears **[5M]**

B A pair of involute spur gears with 16° pressure angle and pitch of module 6 mm is in mesh. The number of teeth on pinion is 16 and its rotational speed is 240 r.p.m. When the gear ratio is 1.75, find in order that the interference is just avoided; the addenda on pinion and gear wheel **[5M]**

OR

11 **A** Explain with neat sketch about simple Epicyclic gear train **[5M]**

B An epicyclic gear consists of three gears A, B and C as shown in Fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and is carried on an arm EF which rotates about the centre of A at 18 r.p.m.. If the gear A is fixed, determine the speed of gears B and C. **[5M]**

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