Code No: R20A0308

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, February 2022

Theory of Machines

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

1 Sketch and explain different kinds of kinematic pairs giving example for each one of them. **[14M]**

OR

2 What is inversion? Explain with help of suitable sketches the inversion of single slider crank chain. **[14M]**

SECTION-II

3 In a pin jointed four bar mechanism ABCD, the lengths of the various links are AB = 30mm, BC=90mm, CD=55mm and AD=85mm. The link AD is fixed and angle BAD is 130^0. If the velocity of 'B' is 2m/sec in clock wise direction, find a) velocity and acceleration of midpoint of link BC and b) Angular velocity of CB and CD. **[14M]**

OR

4 What are the conditions for correct steering and explain with a sketch the working of Ackerman's steering gear mechanism. **[14M]**

SECTION-III

5 An aeroplane runs at 600 km / h. The rotor of the engine weighs 4000 N with radius of gyration of 1 metre. The speed of rotor is 3000 r.p.m. in anticlockwise direction when seen from rear side of the aeroplane. **[14M]**

If the plane takes a loop upwards in a curve of 100 metres radius, find:

1. gyroscopic couple developed; and
2. effect of reaction gyroscopic couple developed on the body of aeroplane.

OR

6 What is turning moment diagram? Explain the turning moment diagram of a four stroke cycle internal combustion engine. **[14M]**

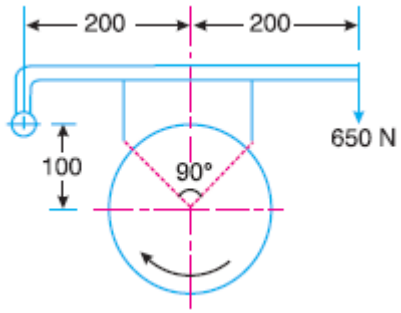
SECTION-IV

7 The thrust of a propeller shaft in a marine engine is taken up by a number of collars integral with the shaft which is 300 mm in diameter. The thrust on the shaft is 200 kN and the speed is 75 r.p.m. Taking μ constant and equal to 0.05 and assuming intensity of pressure as uniform and equal to 0.3 N/mm^2, find the external diameter of the collars and the number of collars required, if the power lost in friction is not to exceed 16 kW. **[14M]**

OR

8 A single block brake, as shown in Figure, has the drum diameter 250 mm. The angle of contact is 90° and the coefficient of friction between the drum and the **[14M]**

lining is 0.35. If the operating force of 650 N is applied at the end of the lever, determine the torque that may be transmitted by the block brake.



All dimensions are in 'mm'

SECTION-V

9 A cam is to be designed for a knife edge follower with the following data: **[14M]**
Cam lift = 40mm during 90° of cam rotation with simple harmonic motion; Dwell for the next 30°; During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion; Dwell during the remaining 180°. Draw the profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft. The radius of the base circle of the cam is 40mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

OR

10 A Porter governor has equal arms each 250mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find the minimum and maximum speeds and range of speed of the governor. **[14M]**

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Code No: **R20A0307**

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOG

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, February 2022

Computer Aided Machine Design

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 28 marks. Answer any two in Part A.
Part B consists of I section which carries 42 marks

***

PART-A

Answer any Two of the following (14*2=28)

Q. No.1 Draw the different Screw thread forms of pitch 20mm. **[14M]**

Q. No.2 Draw the full sectional front view and Top view of a Socket and Spigot Cotter joint. **[14M]**

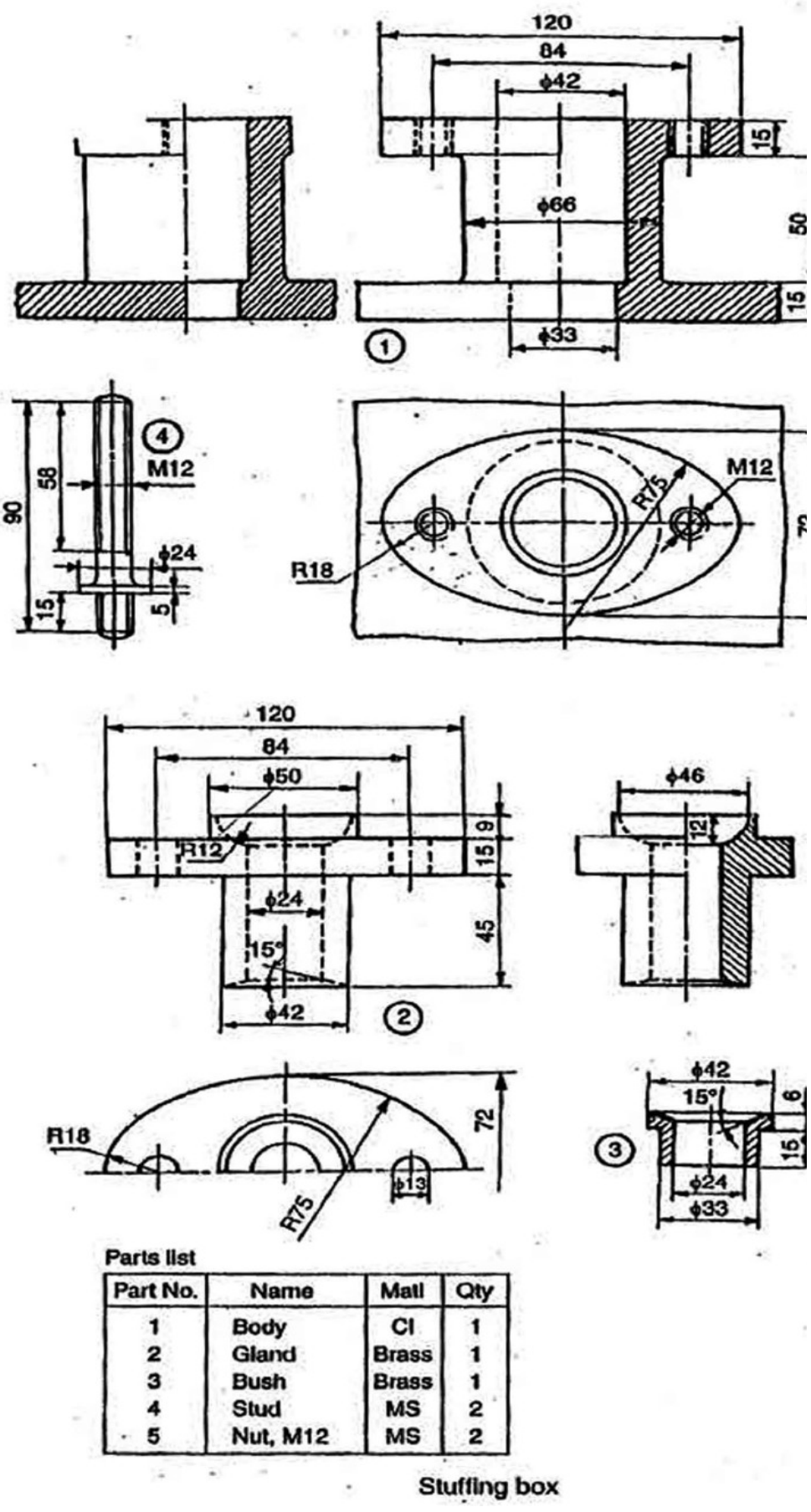
Q. No.3 Draw the front view and top view of a hexagonal nut of nominal size 25mm. **[14M]**

Part- B (42 Marks)

Answer the following (1*42= 42marks)

Q. No.4 Part drawings of a Stuffing Box are shown in Figure-1. Assemble the stuffing box and draw: **[42M]**

(i) Half sectional front view
(ii) Full plan



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut, M12	MS	2

Stuffing box

Figure 1

Code No: R20A0303

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, February 2022

Engineering Mechanics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

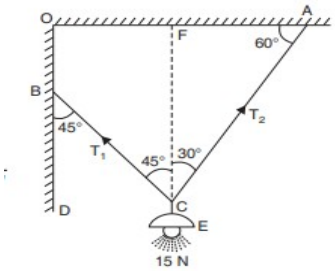
Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

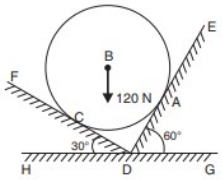
1 **a)** The resultant of two concurrent forces is 1500 N and the angle between the forces is 90°. The resultant makes an angle of 36° with one of the force. Find the magnitude of each force. **[7M]**

b) An electric light fixture weighing 15 N hangs from a point C, by two strings AC and BC. AC is inclined at 60° to the horizontal and BC at 45° to the vertical as shown in Fig. Using Lami's theorem or otherwise determine the forces in the strings AC and BC. **[7M]**

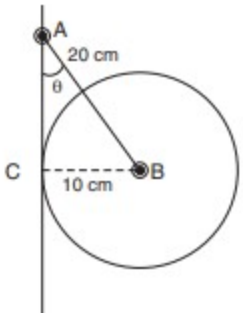


OR

2 a) A ball of weight 120 N rests in a right-angled groove, as shown in Fig. 4.14 (a). The sides of the groove are inclined to an angle of 30° and 60° to the horizontal. If all the surfaces are smooth, then determine the reactions RA and RC at the points of contact. **[7M]**



b) A circular roller of weight 100 N and radius 10 cm hangs by a tie rod AB = 20 cm and rests against a smooth vertical wall at C as shown in Fig. Determine : (i) the force F in the tie rod, and (ii) the reaction R_C at point C.



[7M]

SECTION-II

3 ***a)*** Explain the difference between co-efficient of friction and angle of friction. **[7M]**

b) A body of weight 500 N is pulled up an inclined plane, by a force of 350 N. The inclination of the plane is 30° to the horizontal and the force is applied parallel to the plane. Determine the co-efficient of friction. **[7M]**

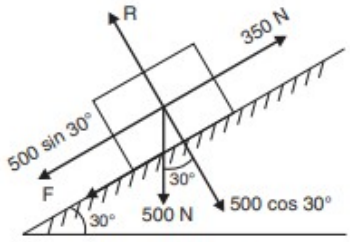
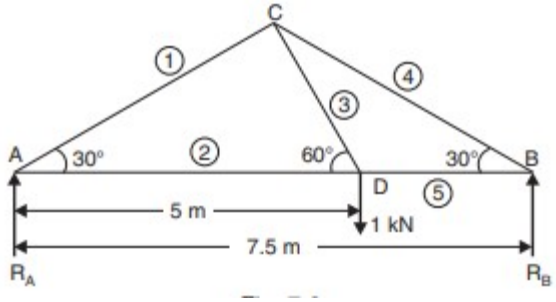


Fig. Body moving up.

OR

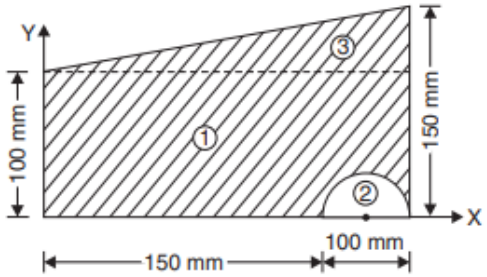
4 ***a)*** What is a frame? State the difference between a perfect frame and an imperfect frame. **[4M]**

b) A truss of span 7.5 m carries a point load of 1 kN at joint D as shown in Fig.Find the reactions and forces in the members of the truss. **[10M]**



SECTION-III

5 a) A semi-circular area is removed from the trapezoid as shown in Fig. Determine the centroid of the remaining area **[10M]**

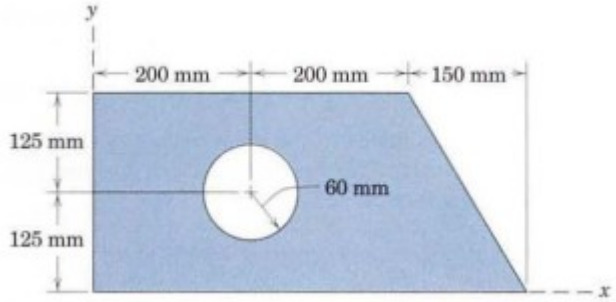


[4M]

a) Define centre of gravity and centroid.

OR

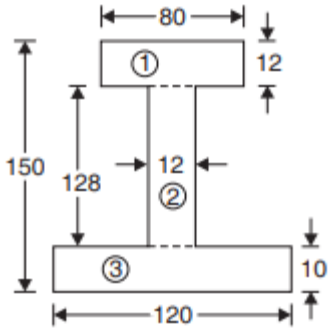
6 a) Determine the coordinates of the centroid of the shaded area. **[10M]**



b) State and explain Pappus theorem **[4M]**

SECTION-IV

7 Determine the moment of inertia of I-section shown in Fig. All dimensions are in mm **[14M]**



OR

8 Determine an expression for mass moment of inertia of hollow steel cylinder of mass M, outer radius R_0, inner radius R_i and length L about its axis. The hole in the cylinder is concentric. **[14M]**

SECTION-V

9 a) A motorist is driving his car at 90 km/hr. He observes red light 200 m ahead turns red. The traffic light is timed to remain red for 15 sec. If the motorist wishes to pass the light without stopping, find the required minimum deceleration **[7M]**

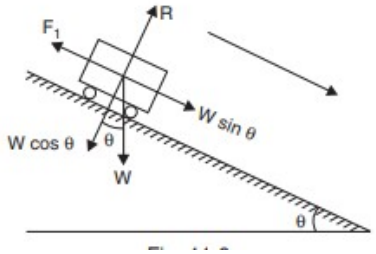
b) A stone is dropped from a height. After falling 5 seconds from rest, the stone breaks the glass pane and in breaking, the stone loses 20% of its **[7M]**

velocity. Find the distance travelled by the stone in the next second. Take g = 9.81 m/s^2

OR

10 a) What do you understand by the term kinematics? Explain different types of plane motion of rigid bodies with suitable example. **[7M]**

b) A truck weighing 6 kN just moves freely (engine is not running) at 36 kilometre per hour down a slope of 1 in 40, the road resistance at this speed just being sufficient to prevent any acceleration. Find the road resistance per kN weight of truck. What power will the engine have to exert to run up the same slope at double the speed when the road resistance remains the same. **[7M]**



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Code No: R20A0304

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOG

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, February 2022

Engineering Thermodynamics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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Note: Steam Tables, Mollier's chart and Psychrometric charts are permitted

SECTION-I

1 a) Explain at least three different causes of irreversibility associated with a process. **[5M]**

b) 2kg of gas at a pressure of 1.5 bar, Occupies a volume of 2.5 m^3. If this gas compresses isothermally to 1/3 times the initial volume. Find initial, Final temperature, work done, heat transfer. **[5M]**

c) A gas at a pressure of 138 kN/m^2 is having volume of 0.112 m^3. It is compressed to 690 kN/m^2 according to the law $pv^{1.4}$=constant. Calculate the final volume of the gas. **[4M]**

OR

2 a)What do you understand by macroscopic and microscopic viewpoints? **[5M]**

b) If a gas of volume 6000cm^3 and at a pressure of 100KPa is compressed quasi-statically according to $pV^{1.2}$=constant until volume becomes 2000 cm^3, determine the final pressure and work transfer. **[5M]**

c) write short notes on **[4M]**

i)Zeroth Law of Thermodynamics

ii)Point and path functions

SECTION-II

3 a) Explain two statements of second law of thermodynamics. Establish its equivalence. **[7M]**

b) A heat engine operating between two reservoirs at temperatures 600°C and 40°C drives a refrigerator operating between reservoirs at temperatures of 40°C and -15°C. The heat transfer to the heat engine is 2500kJ and the net output of the combined engine and refrigerator plant is 400kJ. The efficiency of the heat engine and the COP of the refrigerator are each 40% of the maximum possible values. Estimate heat transfer to the refrigerant and the net heat transfer to the reservoir at 40°C. **[7M]**

OR

4 Obtain Maxwell's equations from basic thermodynamic relations **[14M]**

SECTION-III

5 a) Explain the free expansion process. **[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 **[5M]**

final pressure and heat transfer to the tank.
c) write short notes on
i)Dryness Fraction **[4M]**
ii)Mollier charts

OR

6 a) Write short notes on "Mollier diagram". Why do isobars on the Mollier Diagram diverge from one another? **[7M]**

b) A steam pressure of holding capacity $4m^3$ 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 and (v) Specific Internal Energy of steam. **[7M]**

SECTION-IV

7 a) Discuss why does the enthalpy of air-vapour mixture remains constant during an adiabatic saturation process. **[7M]**

b) Moist air at 1 atm. pressure has a dry bulb temperature of 32^0C and a wet bulb temperature of 26^0C. Calculate i) the partial pressure of water vapour, ii) humidity ratio, iii) relative humidity, iv) dew point temperature, v) density of dry air in the mixture, vi) density of water vapour in the mixture and vii) enthalpy of moist air using perfect gas law model and psychrometric equations. **[7M]**

OR

8 a) Explain Daltons law of partial pressures. **[5M]**

b) Air at 20^0C, 40% RH is mixed adiabatically with air at 40^0C, 40% RH in the ratio of 1 kg of former with 2 kg of the latter (on dry basis). Find the final condition of air. **[5M]**

c) write short notes on Psychrometric Properties **[4M]**

SECTION-V

9 a) Explain the air standard Otto cycle with the help P-V and T-S diagrams. **[7M]**

b) An engine works on a diesel cycle with an Inlet pressure and temperature of 1 bar and 17^0C. The pressure at the end of the adiabatic compression is 35 bar. The ratio of expansion, i.e. after constant pressure heat addition is 5. Calculate the heat addition, heat rejection and efficiency of the cycle. Assume r=1.4, Cp=1.005 kJ/kgk C_v=0.717 kJ/kgk. **[7M]**

OR

10 Explain the Diesel cycle with the help of P-V and T-S diagrams. Derive the expression for air standard efficiency mean effective pressure. **[14M]**

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Code No: R20A0305

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNO

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, February 2022

Fluid Mechanics & Hydraulic Machines

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

1 a) Write briefly about different types of Pressure measuring devices **[7M]**

b) A fan delivers 4 m^3 of air per second at 20^0C and 1.25 bar. Assuming molecular weight of air as 28.97, calculate the mass of air delivered. Also determine the density, specific volume and specific weight of the air being delivered. **[7M]**

OR

2 a) Explain about atmospheric pressure and vacuum pressure. **[7M]**

b) A simple U-tube manometer containing mercury is connected to a pipe in which a fluid of specific gravity 0.8 and having vacuum pressure is flowing. The other end of the manometer is open to atmosphere. Find the vacuum pressure in pipe, if the difference of mercury level in the two limbs is 40 cm and the height of fluid in the left from the centre of pipe is 15cm below. **[7M]**

SECTION-II

3 Distinguish between:

i) Steady flow and un-steady flow, **[3M]**

ii) Uniform and nonuniform flow **[3M**

iii) Compressible and incompressible flow, **[3M]**

iv) Rotational and irrigational flow **[3M]**

v) Laminar and turbulent flow. **[2M]**

OR

4 a) Derive Bernoullis equation and state assumptions **[7M]**

b) The water is flowing through a pipe having diameters 20cm and 10cm at sections 1 and 2 respectively. The rate of flow through pipe is 35litres/s. The section 1 is 6m above datum and section 2 is 4m above datum. If the pressure at section 1 is 3924 N/cm^2 find the intensity of pressure at section 2. **[7M]**

SECTION-III

5 a) Explain laminar boundary layer over a thin flat plate. **[7M]**

b) A pitot-tube is inserted in a pipe of 300 mm diameter. The static pressure in pipe is 100 mm of mercury (vacuum). The stagnation pressure at the center of the pipe, recorded by the pitot tube is 0.981 N/cm^2. Calculate the rate of flow of water through pipe, if the mean velocity of flow is 0.85 times the central velocity. Take Cv=0.98. **[7M]**

OR

6 a) Derive Darcy-Weisbach equation for loss of head in a pipe. **[7M]**

b) Explain about total energy line and hydraulic gradient line. **[7M]**

SECTION-IV

7 a) Show the governing mechanism of a Pelton wheel turbine with a neat sketch and explain how it works. **[7M]**

b) A Pelton wheel has a mean bucket speed of 10 meters per second with a jet of water flowing at the rate of 700 litres/s under a head of 30 meters. The buckets deflect the jet through an angle of 1600. Calculate the power given by water to the runner and hydraulic efficiency of the turbine. Assume co-efficient of velocity as 0.98. **[7M]**

OR

8 a) What is the necessity of a Surge Tank in turbines? Explain different types of surges with the aid of neat diagrams. **[7M]**

b) An impulse turbine develops 4500 kW under a head of 200 meters. The turbine runner has a speed of 200 rpm and discharge of 0.8 cubic meter of water per second. If the head on the same turbine falls during summer to 184.3 meters, find the new discharge, power and speed of the turbine. **[7M]**

SECTION-V

9 a) Obtain an expression for the work done by impeller of a centrifugal pump on water per second per unit weight of water. **[7M]**

b) The internal and external diameters of the impeller of a centrifugal pump are 200 mm and 400 mm respectively. The pump is running at 1200 r.p.m. The vane angles of the impeller at inlet and outlet are 200 and 300 respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. **[7M]**

OR

10 (a) Compare centrifugal and reciprocating pumps. **[7M]**

(b)A centrifugal pump of 1.5 meter diameter runs at 210 rpm and pumps 180 liters of water per second. The angle which the vane makes at exit with the tangent to the impeller is 25. Assuming radial entry and velocity of flow throughout as 2.5 m/s determine the power required to drive the pump. If manometric efficiency of the pump is 65%, find the average lift of the pump. **[7M]**

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Code No: R20A0306

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHN(

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Regular Examinations, February 2022

Metallurgy & Material Science

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

1	a)	Discuss in detail about covalent bond in solids.	**[7M]**
	b)	With a neat sketch explain FCC crystal structure and calculate the effective number of atoms.	**[7M]**
		OR	
2	a)	Discuss the effect of grain boundaries on the properties of the material	**[7M]**
	b)	Discuss about electron compound.	**[7M]**

SECTION-II

3		Draw and explain the phase diagram where two components are completely soluble in both liquid and solid state with suitable example.	**[14M]**
		OR	
4		Indicate the different invariant reactions in Fe-Fe_3C phase diagram and draw and label all the phases	**[14M]**

SECTION-III

5	a)	Classify different types of cast irons. Explain the effect of any four alloying elements on the properties of cast iron.	**[7M]**
	b)	Discuss the properties and applications of Aluminium.	**[7M]**
		OR	
6	a)	Explain in detail Hadfield Manganese steel and its properties.	**[7M]**
	b)	Discuss about Tool steels.	**[7M]**

SECTION-IV

7	a)	Write the effect of alloying elements on Fe-Fe_3C system?	**[7M]**
	b)	Explain hardening and tempering process.	**[7M]**
		OR	
8	a)	Write the classification of ceramics? Explain with examples.	**[7M]**
	b)	Why hardening of steel is followed by tempering? Explain.	**[7M]**

SECTION-V

9	a)	Explain the importance and applications of Carbon-Carbon composites.	**[7M]**
	b)	Explain the process of steel making by open Hearth process.	**[7M]**
		OR	
10	a)	Write about metal matrix composites with regard to physical and mechanical properties and their applications?	**[7M]**
	b)	Discuss the advantages and limitations of powder metallurgy.	**[7M]**

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Code No: R20A0307

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, January 2024

Computer Aided Machine Design

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 28 marks. Answer any two in Part A.
Part B consists of I section which carries 42 marks

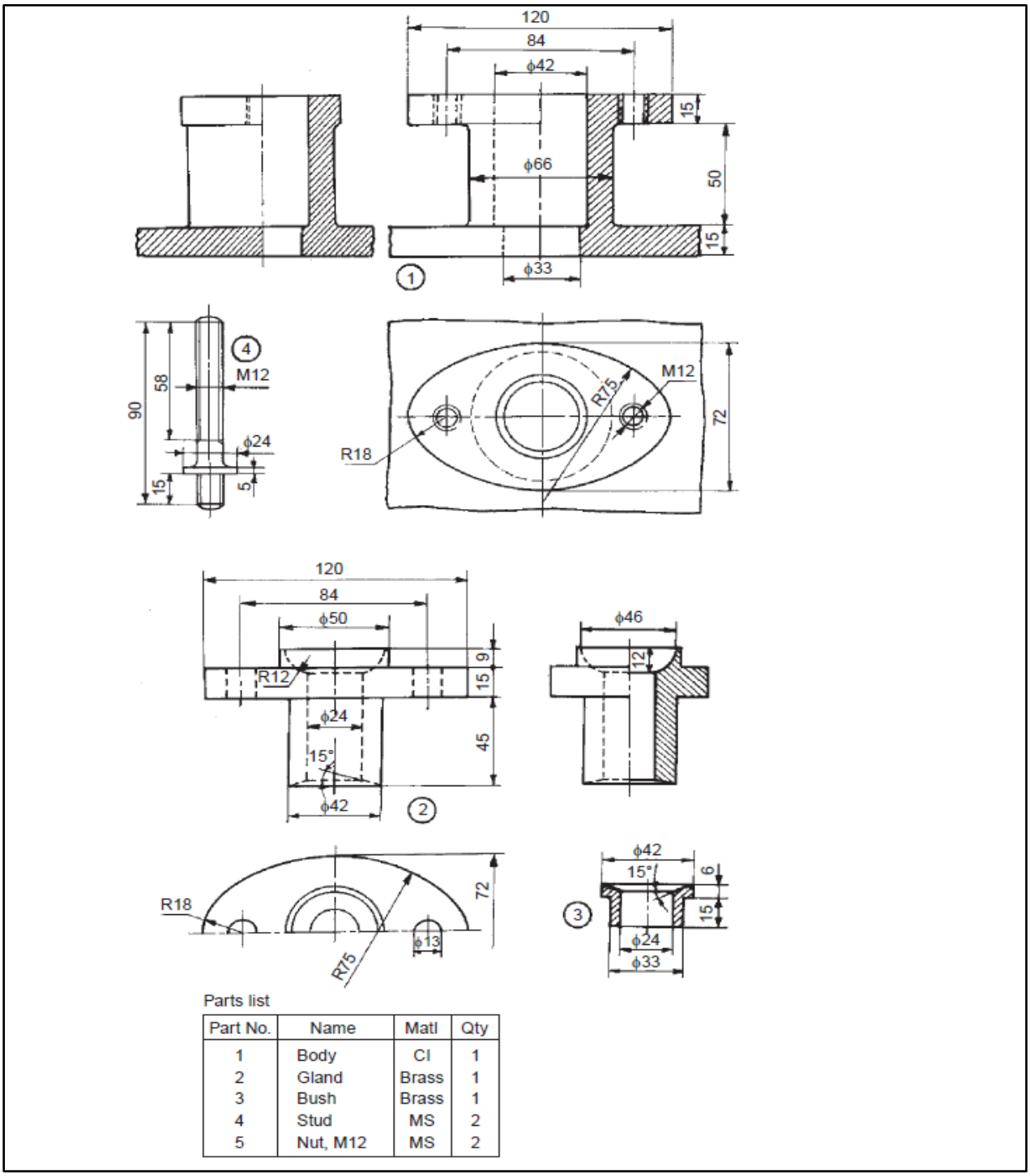
Part- A (28 Marks)

Answer any two of the following **(14*2=28M)**

1. Draw two views of a single riveted butt joint with a single cover plate for a plate thickness of 16 mm.
2. Draw gib and cotter joint suitable for joining 40 mm square rods.
3. Draw three views of a hexagonal and square nut for 30 mm diameter bolt.

Part-B (42 Marks)

4. The details of stuffing box are shown in figure. Assemble the parts and draw **(1*42=42M)**
   (*i*) half sectional view from the front, with left half in section,
   (*ii*) half sectional view from the right hand
   (*iii*)view from above .
   All the dimensions are in mm.



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut, M12	MS	2

R20

Code No: R20A0303

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, January 2024

Engineering Mechanics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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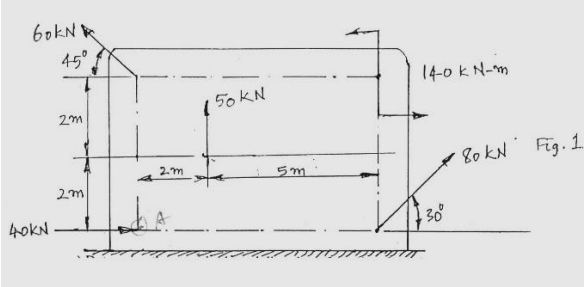
SECTION-I

1 ***A*** State and prove the principle of moments. **[4M]**

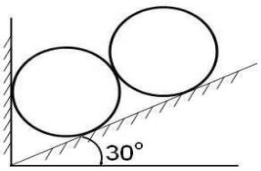
B Determine the resultant of the four forces and a couple that acts on the plate sh **[10M]** Figure.



OR

2 ***A*** State and explain the law of Parallelogram **[4M]**

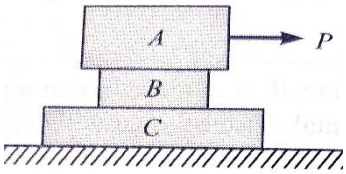
B Two identical rollers, each of weight 500N, are supported by an inclined plane making an angle of 30^0 to the horizontal and a vertical wall as shown in the figure i) Sketch the free body diagrams of the two rollers. ii) Assuming smooth surfaces, find the reactions at the support points. **[10M]**



SECTION-II

3 ***A*** State laws of friction? **[4M]**

B Find the least horizontal force P to start motion of any part of the system of three blocks resting upon one another as shown in figure. The weights of the blocks are W_A = 300 N, W_B = 100 N, and W_C = 200 N Between A and B μ = 0.3, between B and C μ = 0.2, and between C and the ground μ = 0.1 **[10M]**



OR

4 ***A*** List out the assumptions made in analysis of Perfect Frames **[4M]**

B The cantilever truss in Fig.2 is hinged at D and E. Distance between D and E is 5m Find the force in each member **[10M]**

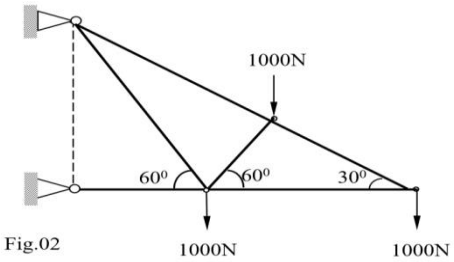
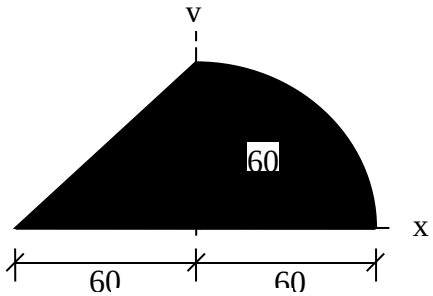


Fig.02

SECTION-III

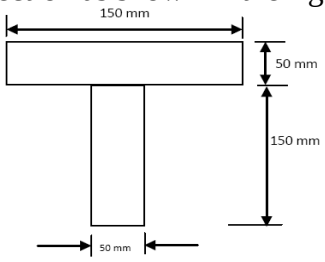
5 ***A*** Derive the expression for the centroid for a semi-circle about the diameter. **[7M]**

B Locate the centroid C of the shaded area as shown in Fig. **[7M]**



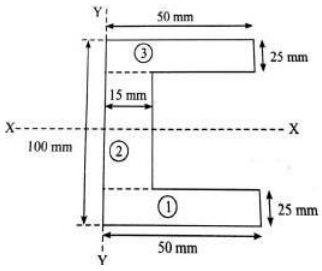
OR

6 Locate the centroid of T-section as shown in the figure given below. **[14M]**



SECTION-IV

7 Determine moment of inertia of given section about centroidal XX axis. **[14M]**



OR

8 Determine the mass moment of inertia of a homogeneous right circular cone of mass M, base radius R and altitude h with respect to its geometric axis of rotation. **[14M]**

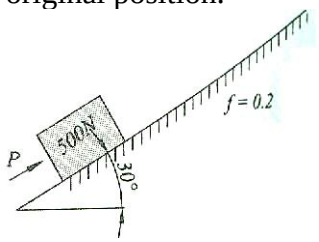
SECTION-V

9 ***A*** A stone is dropped down a well and 5 sec later the sound of splash is heard. If the velocity of sound is 341 m/s, what is the depth of the well. **[10M]**

B List out the assumptions made in the analysis of projectile? **[4M]**

OR

10 A block of weight 500N, starts from rest due to a force P = 1000N, and moves over a rough inclined surface as shown in figure below. After moving by 15m up along the incline, the force P is then removed. Find the velocity of block when it regains its original position. **[14M]**



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Code No: R20A0304 **R20**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, January 2024

Engineering Thermodynamics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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Note: Psychometric charts and steam tables are permitted

SECTION-I

1	***A***	What is a thermodynamic system? What is the difference between a closed system and an open system? Give few examples for closed and open systems.	**[7M]**
	B	Discuss the macroscopic and micro scopic point of view of thermodynamics.	**[7M]**
		OR	
2	***A***	A certain water heater operates under steady flow conditions receiving 4.2 kg/s of water at 75°C temperature, enthalpy 313.93 kJ/kg. The water is heated by mixing with steam which is supplied to the heater at temperature 100.2°C and enthalpy 2676kJ/kg. The mixture leaves the heater as liquid water at temperature 100uC and enthalpy 419 kJ/kg. How much steam must be supplied to the heater per hour?	**[9M]**
	B	State the first law of Thermodynamic and which is the property introduced by the First law?	**[5M]**

SECTION-II

3	***A***	One kg of ice at - 5° C is exposed to the atmosphere which is at 20°C. The ice melts and comes into thermal equilibrium with the atmosphere. (a) Determine the entropy increase of the universe. (b) What is the minimum amount of work necessary to convert the water back into ice at - 5°C? Cp of ice is 2.093 kJ/kg K and the latent heat of fusion of ice is 333.3 kJ/kg.	**[9M]**
	B	What does the principle of entropy increase specify?	**[5M]**
		OR	
4	***A***	A fluid undergoes a reversible adiabatic compression from 0.5 MPa, 0.2 m^3 to 0.05 m^3 according to the law, $pv^{1.3}$ = constant. Determine the change in enthalpy, internal energy and entropy, and the heat transfer and work transfer during the process.	**[9M]**
	B	What is difference between maximum work and useful work.	**[5M]**

SECTION-III

5	***A***	The following data were obtained with a separating and throttling calorimeter: Pressure in pipeline 1.5. MPa Condition after throttling 0.1 MPa, 110° C During 5 min moisture collected in the separator 0.150 liter at 70° C Steam condensed after throttling during 5 min 3.24 kg. Find the quality *of* the steam in the pipe line.	**[7M]**

	B	Draw the phase equilibrium diagram for a pure substance on T-S plot with relevant constant property lines.	**[7M]**

OR

6	***A***	A large insulated vessel is divided into two chambers, one containing 5 kg of dry saturated steam at *0.2* MPa and the other 10 kg of steam, *0.8* quality at *0.5* MPa. If the partition between the chambers is removed and the steam is mixed thoroughly and allowed to settle, find the final pressure, steam quality, and entropy change in the process.	**[7M]**
	B	Explain with a neat diagram p-V-T surface.	**[7M]**

SECTION-IV

7	***A***	If one mole of mono-atomic gas is mixed with one mole of diatomic gas, what will be the molar heat capacity at constant volume for the mixture.	**[7M]**
	B	0.5 kg of air is compressed reversibly and adiabatically at 80 kPa, 60° C to 0.4MPa, and is then expanded at, constant pressure to the original volume. Sketch these processes on the p-v and T - s planes. Compute the heat transfer and work transfer for the whole path.	**[7M]**

OR

8	***A***	A mass of air is initially at 260°C and 700 kPa, and occupies 0.028 m^3. The air is expanded at constant pressure to 0.084 m^3. A polytropic process with n = 1.50 is then carried out, followed by a constant temperature process which completes a cycle. All the processes are reversible. (a) Sketch the cycle in the p-v and T-s planes (b) Find the heat received and the heat rejected in the cycle (c) Find the efficiency of the cycle.	**[8M]**
	B	Explain the terms i)Wet bulb temperature ii) relative humidity.	**[6M]**

SECTION-V

9		In an air standard Diesel cycle, the compression ratio is 16, and at the beginning of isentropic compression, the temperature is I5^{o}C and the pressure is 0.1 MPa. Heat is added until the temperature at the end of the constant pressure process is 1480°C. Calculate (a) the cut - off ratio, (b) the heat supplied per kg of air, (c) the cycle efficiency, and (d) the m.e.p.	**[14M]**

OR

10		Explain the air standard Brayton cycle with the help P-V and T-S diagrams.	**[14M]**

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R20

Code No: R20A0305

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, January 2024

Fluid Mechanics & Hydraulic Machinery

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

1	A	Define the following terms: i)Specific gravity ii)viscosity iii)Capillraity	**[7M]**
	B	If the velocity profile of a fluid over a plate is parabolic with the vertex 20cm from the plate, where the velocity is 120cm/sec. Calculate the velocity gradients and shear stresses at a distance of 0,10 and 20cm from the plate,if the viscosity of the fluid is 8.5 poise.	**[7M]**
		OR	
2	A	i) What do you mean by vaccum pressure ii) What is Manometer? How they are classified iii) Differentaite between Absolute pressure and gauge pressure	**[2M]** **[2M]** **[3M]**
	B	A simple U-tube manometer containing mercury is connected to a pipe in which an oil of sp.gr. 0.8 is flowing. The pressure in the pipe is vaccum. The other end of the manometer is open to the atmosphere. Find vaccum pressure in a pipe, if the difference of mercury level in the two limbs is 20cm and height of oil in the left limb from the centere of the pipe is 15cm below.	**[7M]**

SECTION-II

3	A	Define and distingush between Stream lines, pathlines, streak lines and stream tube	**[7M]**
	B	State the momentum equation. How will you apply momentum equation for determining the force exerted by a flaoting liquid on a pipe bend?	**[7M]**
		OR	
4	A	A 0.225m diameter cylinder is 1.5m long and contains water up to height of 1.05m, estimate the speed at which the cylinder may be rotated about its vertical axis so that the axial depth becomes zero.	**[7M]**
	B	Formulate Euler's equation of motion long a stream line integrate it to obtain Bernoulli's equation. State all asumption made.	**[7M]**

SECTION-III

5	A	Determine the loss of head due to friction in pipe by using (i) Darcy formula (ii)Chezy's fromula?	**[7M]**
	B	A pipe of 300mm diameter coveying $0.3m^3/s$ of water has a right-angled bend in a horizental plane.Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are $24.252N/cm^2$	**[7M]**

OR

6	A	What do you mean by boundary layer separtion? What is the effect of pressure gradient on boundary layer seperation Explain?	**[7M]**
	B	A horizental venturimetre with inlet and throat diameters 30cm and 15cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and throat is 20cm of mercury. Determine the rate of flow. Take C_d=0.98	**[7M]**

SECTION-IV

7	A	List out various characterstics of turbines and explain any one in detail.	**[7M]**
	B	A kaplan turbine runner is to be designed to develop 9100Kw. The net available head is 5.6m. If the speed ratio=0.68, overall efficiency=86% and the diameter of the boss is 1/3 the diameter of the runner. Find the diameter of the runner, its speed and the specific speed of the turbine.	**[7M]**

OR

8	A	Differentiate between(i) the impulse and reaction turbine and (ii) radial and axial flow turbines.	**[7M]**
	B	A 2.5cm diameter jet of water strikes a symmetrical vane tangentially at one end and leaves at the other end. After impingment, the jet gets deflected through 160^0 by the vane. Calculate the thrust exerted by jet on the vane if the discharge is 0.0736m^3/sec. Assume the vane to be smmoth	**[7M]**

SECTION-V

9	A	Explain the principle and working of a centrifugal pump with a neat sketch.	**[7M]**
	B	A centrifugal pump delivers water against a net head of 14.5 m and design speed of 1000rpm. The vanes are curved back to an angle of 300 with periphery. The impeller diameter is 300 mm and outlet width 50mm. Determine the discharge of the pump if the manometric efficiency is 95%	**[7M]**

OR

10	A	Define and explain slip, percentage slip and negative slip of a reciprocating pump	**[7M]**
	B	What is indicator diagram for a reciprocating pump? Explain slip and coefficient of discharge of a reciprocating pump.	**[7M]**

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R20

Code No: R20A0306

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, January 2024

Metallurgy & Material Science

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

1	A	Define solid solution. Draw and explain substitution and interstitial solid solutions.	**[10M]**
	B	Explain Hume-Rothery rules and state the conditions for unlimited solid solubility	**[4M]**
		OR	
2	A	Describe strengthening by grain size reduction and solid solution strengthening	**[7M]**
	B	What are various imperfections of solids? Explain briefly	**[7M]**

SECTION-II

3	A	Explain effect of alloying elements on iron-iron carbide diagram showing phase diagram	**[7M]**
	B	Define following i) Phase rule ii) Lever rule	**[7M]**
		OR	
4	A	Write the peritectic, eutectic and euctoid reactions of Fe-Fe3C phase diagram	**[7M]**
	B	What are various experimental methods of construction of equlibrium diagrams?	**[7M]**

SECTION-III

5	A	Explain the micro structure, properties and applications of different types of malleable cast irons	**[7M]**
	B	What are importance of stainless steels? Give its applications of different types of stainless steels.	**[7M]**
		OR	
6	A	Explain the structure and properties of spheroid graphite cast iron	**[7M]**
	B	What are different non-ferrous alloys? Explain the alloys of copper and aluminium	**[7M]**

SECTION-IV

7	A	Differentiate between annealing and normalizing	**[7M]**
	B	what is hardening? Briefly explain the method of flame hardening?	**[7M]**
		OR	
8	A	Compare the properties and applications of ceramics with metals	**[7M]**
	B	What are TTT diagrams? How they prepared? What is their significance?	**[7M]**

SECTION-V

9	A	What is a composite material? Give example. Explain their advantages and disadvantages	**[7M]**
	B	Explain various methodsof components manufacture of composite materials with examples	**[7M]**
		OR	
10	A	What is polymer? And explain the types of polymers.	**[7M]**
	B	What are carbon composites? Briefly discuss their characteristics	**[7M]**

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Code No: R20A0308

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, January 2024

Theory of Machines

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

***

SECTION-I

1	***A***	Sketch and explain the working of Scotch Yoke Mechanism.	**[7M]**
	B	Define link? Discuss the various types of links.	**[7M]**
		OR	
2		What is kinematic pair? Explain types of kinematics pairs with a neat sketch.	**[14M]**

SECTION-II

3		If 'P' is a point on a link OR which is rotating about the fixed point 'O' with an angular velocity of ω, and P is sliding inwards towards 'O' on the link OR with a linear velocity v, derive the expression for Coriolis component of acceleration when (a) both ω and v are constant, b) both ω and v vary with time.	**[14M]**
		OR	
4		What are the conditions for correct steering and explain with a sketch the working of Ackerman's steering gear mechanism.	**[14M]**

SECTION-III

5		A rear engine automobile is travelling along a track of 100 meters mean radius. Each of the four road wheels has a moment of inertia of 2.5 kg-m2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.2 kg-m2. The engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3:1. The automobile has a mass of 1600 kg and has its centre of gravity 0.5 m above road level. The width of the track of the vehicle is 1.5 m. Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with the road surface. Assume that the road surface is not cambered and centre of gravity of the automobile lies centrally with respect to the four wheels.	**[14M]**
		OR	
6	***A***	Explain the turning moment diagram of a four-stroke cycle internal combustion engine.	**[7M]**
	B	Discuss the turning moment diagram of a multicylinder engine.	**[7M]**

SECTION-IV

7	***A***	Describe with a neat sketch a centrifugal clutch and deduce an equation for the total torque transmitted	**[7M]**
	B	Describe with a neat sketch the working of a single plate friction clutch.	**[7M]**

OR

8		Describe with the help of a neat sketch the principles of operation of an internal expanding shoe. Derive the expression for the braking torque.	**[14M]**

SECTION-V

9	***A***	Explain various types of follower motions used in cam mechanisms.	**[7M]**
	B	Draw and explain the displacement and velocity diagrams for simple harmonic motion	**[7M]**

OR

10		The arms of a Porter governor are each 250 mm long and pivoted on the governor axis. The mass of each ball is 5 kg and the mass of the central sleeve is 30 kg. The radius of rotation of the balls is 150 mm when the sleeve begins to rise and reaches a value of 200 mm for maximum speed. Determine the speed range of the governor. If the friction at the sleeve is equivalent of 20 N of load at the sleeve, determine how the speed range is modified.	**[14M]**

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Code No: R20A0308

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2022

Theory of Machines

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Answer Any **Five** Questions
All Questions carries equal marks.
***

1 a) Explain the term kinematic link. Give the classification of kinematic link. **[7M]**
b) What is a machine? In what way a mechanism differ from a machine? **[7M]**

2 Explain with help of suitable sketches the inversion of quadric cycle chain. **[14M]**

3 Describe the procedure to draw velocity and acceleration diagrams of a four-link mechanism. In what way are the angular accelerations of the output link and coupler found? **[14M]**

4 What is an automobile steering gear mechanism? What are its type? Which steering gear mechanism is preferred and why? **[14M]**

5 A rear engine automobile is travelling along a track of 100 metres mean radius. Each of the four road wheels has a moment of inertia of 2.5 kg-m^2 and an effective diameter of 0.6 m. The rotating parts of the engine have a moment of inertia of 1.2 kg-m^2. The engine axis is parallel to the rear axle and the crankshaft rotates in the same sense as the road wheels. The ratio of engine speed to back axle speed is 3: 1. The automobile has a mass of 1600 kg and has its centre of gravity 0.5 m above road level. The width of the track of the vehicle is 1.5 m. **[14M]**
Determine the limiting speed of the vehicle around the curve for all four wheels to maintain contact with the road surface. Assume that the road surface is not cambered and centre of gravity of the automobile lies centrally with respect to the four wheels.

6 In a turning moment diagram, the areas above and below the mean torque line taken in order are 4400, 1150, 1300 and 4550 mm^2 respectively. The scales of the turning moment diagram are: **[14M]**
Turning moment, 1 mm = 100 N-m; Crank angle, 1 mm = 1°
Find the mass of the flywheel required to keep the speed between 297 and 303 r.p.m., if the radius of gyration is 0.525 m.

7 Derive from first principles an expression for the friction moment of a flat pivot bearing assuming (*i*) Uniform pressure, and (*ii*) Uniform wear. **[14M]**

8 The arms of a Porter governor are 300 mm long. The upper arms are pivoted on the axis of rotation and the lower arms are attached to the sleeve at a distance of 35 mm from the axis of rotation. The load on the sleeve is 54 kg and the mass of each ball is 7 kg. Determine the equilibrium speed when the radius of rotation of the balls is 225 mm. What will be the range of speed for this position, if the frictional resistances to the motion of the sleeve are equivalent to a force of 30 N? **[14M]**

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Code No: R20A0303

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL(

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2022

Engineering Mechanics

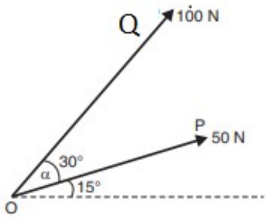
(ME)

Roll No										

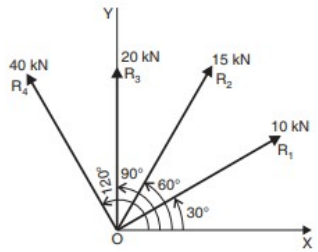
Time: 3 hours **Max. Marks: 70**

Answer Any **Five** Questions
All Questions carries equal marks.
***

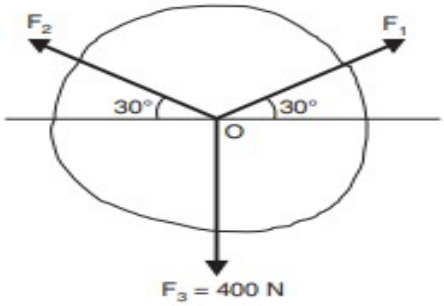
1 **a)** Two forces are acting at a point O as shown in Fig. Determine the resultant in magnitude and direction. **[7M]**



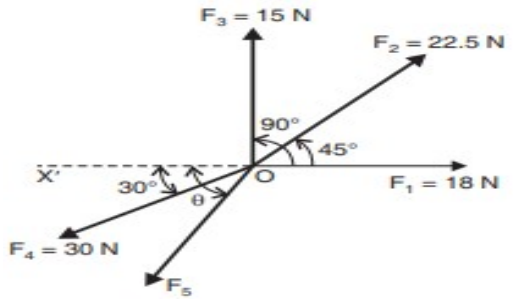
b) Four forces of magnitude 10 kN , 15 kN, 20 kN and 40 kN are acting at a point O as shown in Fig. The angles made by 10 kN, 15 kN, 20 kN and 40 kN with X-axis are 30°, 60°, 90° and 120° respectively. Find the magnitude and direction of the resultant force. **[7M]**



2 a) Three forces F_1, F_2 and F_3 are acting on a body as shown in Fig. The body is in equilibrium. If the magnitude of force F_3 is 400 N, find the magnitudes of force F_1 and F_2. **[7M]**

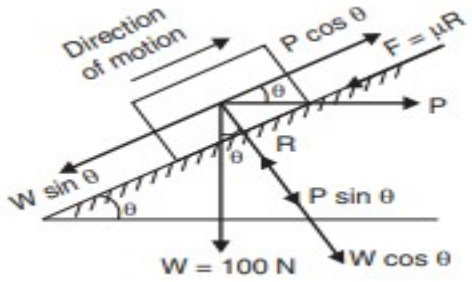


b) The five forces F_1, F_2, F_3, F_4 and F_5 are acting at a point on a body as shown in Fig. The body is in equilibrium. If $F_1 = 18$ N, $F_2 = 22.5$ N, $F_3 = 15$ N and $F_4 = 30$ N, find the force F_5 in magnitude and direction. **[7M]**

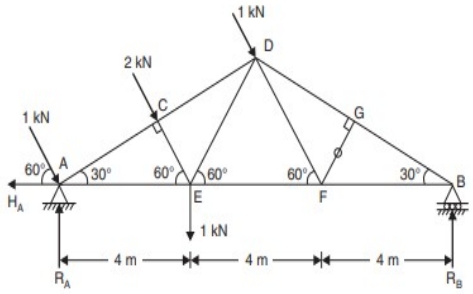


3 ***a)*** Explain the following : (i) Laws of static friction, and (ii) Limiting angle of friction **[7M]**

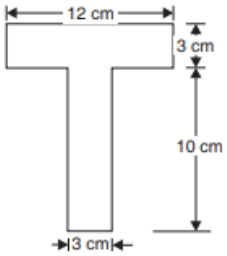
b) A rough inclined plane, co-efficient of friction is 0.3, rises 1 cm for every 5 cm of its length. Calculate the effort require to drag a body weighing 100 N up the plane : (i) when the effort is applied horizontally, and (ii) when the effort is applied parallel to the plane **[7M]**



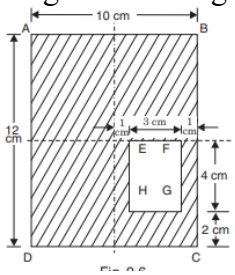
4 Determine the forces in the truss shown in Fig. which is subjected to inclined loads **[14M]**



5 ***a)*** Find the centriod of the T-section shown in Fig. **[7M]**

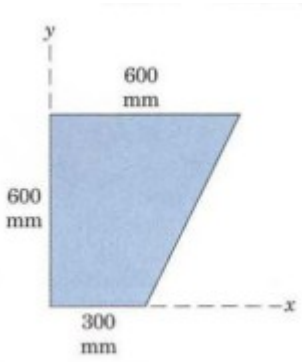


b) From a rectangular lamina ABCD 10 cm × 12 cm a rectangular hole of 3 cm × 4 cm is cut as shown in Fig. Find the c.g. of the remainder lamina **[7M]**

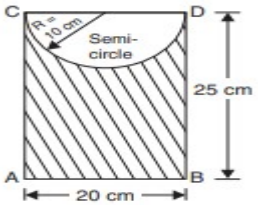


6 ***a)*** State and prove perpendicular axis theorem **[4M]**

b) Determine the coordinates of the centroid of the trapezoidal area shown in fig. **[10M]**



7 Find the moment of inertia of the area shown shaded in Fig. about edge AB. **[14M]**



8 a) A body is moving with uniform acceleration and covers 15 m in fifth second and 25 m in 10^{th} second. Determine: (i) the initial velocity of the body, and (ii) acceleration of the body. **[7M]**

b) A stone dropped into a well is heard to strike the water after 4 seconds. Find the depth of the well, if the velocity of sound is 350 m/sec. **[7M]**

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Code No: R20A0304

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLO

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2022

Engineering Thermodynamics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Answer Any **Five** Questions
All Questions carries equal marks.
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Note: Steam tables, psychometric chart and Mollier charts are permitted

1 a) Explain why the heat and work as path functions. **[4M]**
b) Describe the causes of irreversibility. **[5M]**
c) A mass of gas is compressed in a quasi-static process from 80 kPa, 0.1 m^3 to 0.4 MPa, 0.03 m^3 . Assuming that the pressure and volume are related by pv^n = constant, find the work done by the gas system. **[5M]**

2 a) What is a quasi-static process? What is its characteristic feature? **[5M]**
b) Explain the zeroth law of thermodynamics with neat sketch. Explain how it is important in establishing the temperature scale. **[4M]**
c) Define a new thermodynamic scale say degrees N, in which the freezing point and boiling point of water are 1000N and 3000N respectively. Correlate this temperature scale with centigrade scale. **[5M]**

3 a) Define Kelvin –Planck and Clausius statements. Prove that violation of one Statement leads to a violation of the other Statement. **[7M]**
b) Two reversible heat engines A and B are arranged in series, A rejecting heat directly to B. Engine A receives 200 kJ at a temperature of 421°C from a hot source, while engine B is in communication with a cold sink at a temperature of 4.4°C. If the work output of A is twice that of B, find **[7M]**
(I) The intermediate temperature between A and B
(ii) The efficiency of each engine
(iii) The heat rejected to the cold sink

4 a) Write the Maxwell's equations and derive the first and second Tds equations. **[7M]**
b)A heat engine operating between two reservoirs at 1000 K and 300 K is used to drive a heat pump which extracts heat for the reservoir at 300 K at a rate twice at which the engine rejects heat to it. If the efficiency of the engine is 40% of the maximum possible and the COP of the heat pump is 50% of the maximum possible, what is the temperature of the reservoir at which the heat pump rejects heat? What is the rate of heat rejection from the heat pump if the rate of heat supply to the engine is 50 KW. **[7M]**

5	a) Draw the phase equilibrium diagram for a pure substance on T-s plot with relevant constant property lines.	**[7M]**
	b) In a steam engine cylinder, dry and saturated steam expands from 22 bar to 2 bar isothermally. Calculate (a)Change in enthalpy (b)Change in internal energy (c)Change in entropy (d)Heat transferred (e)work done. Assume the non-flow process in the cylinder	**[7M]**
6	a) What do you understand by triple point? Give the pressure and temperature of water at its triple point.	**[7M]**
	b) A rigid vessel contains 1 kg of a mixture of saturated water and saturated steam at a pressure of 0.15 MPa. When the mixture is heated, the state passes through the critical point. Determine (i) The volume of the vessel (ii) The mass of liquid and of vapour in the vessel initially	**[7M]**
7	a)What do you understand by dry bulb temperature and wet bulb temperatures? When do the DBT,WBT and DPT become equal?	**[7M]**
	b)Air at 40^0C DBT and 27^0C WBT is to be cooled and dehumidified by passing it over a refrigerant filled coil to give a final condition of 15^0C and 90% RH. Find the amount of heat and moisture removed per kg of dry air.	**[7M]**
8	a) Two engines are to operate on Otto and Diesel cycles with the following data: Maximum temperature 1400 K, exhaust temperature 700 K. State of air at the beginning of compression 0.1 MPa, 300K. Estimate the compression ratios, the maximum pressures, efficiencies, and rate of work outputs (for 1 kg/min of air) of the respective cycles.	**[8M]**
	b) How is a reversed Brayton cycle used for refrigeration?	**[6M]**

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Code No: R20A0305

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLO

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2022

Fluid Mechanics & Hydraulic Machines

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Answer Any **Five** Questions
All Questions carries equal marks.
*****

1 a) Define fluid properties : Surface tension and Capillarity. **[7M]**
b)The right limb of a simple U tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp.gr. 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of the fluid in the pipe if the difference of mercury level in the two limbs is 20 cm. **[7M]**

2 a) Differentiate between U-tube and Differential Manometer with a neat sketch. **[7M]**
b) The space between two square flat parallel plates is filled with oil. Each side of the plate is 60 cm. The thickness of the oil film is 12.5 mm. The upper plate, which moves at 2.5 metre per sec, requires a force of 98.1 N to maintain the speed. **[7M]**
Determine: (i) The dynamic viscosity of the oil in poise, and (ii) The kinematic viscosity of the oil in stokes if the specific gravity of the oil is 0.95.

3 a) Define steady, unsteady, laminar, turbulent flow. **[7M]**
b) Obtain Euler's equation of motion along a stream line and hence drive Bernoulli's equation for steady incompressible fluid flow. **[7M]**

4 a) Explain (i) Stream line (ii) Irrotational Flow (iii) Streak line. **[7M]**
b) State the momentum equation, In what way does it differ from impulse momentum equation. Mention some of its engineering applications. **[7M]**

5 a) Explain with a neat sketch Reynolds experiment to classify flow. **[7M]**
b) A 20 x 10 cm venture meter is provided in a vertical pipe line carrying oil of specific gravity 0.8, the flow being upward. The difference in elevation of the throat section and entrance section of the venture meter is 50 cm. The differential U-tube mercury manometer shows a gauge deflection of 40 cm. **[7M]**
Calculate: (i) The discharge of oil. (ii) The pressure difference between the entrance section and the throat section take. Take Cd = 0.98.

6 a) Explain pipes in series and pipe in parallel with a neat sketch. Also write about Hydraulic Gradient line and Total energy line. **[7M]**
b) A flat plate of 2.0 m width and 4.0 m length is kept parallel to air flowing at a velocity of 5 m/s. Determine the length of plate over which the boundary layer is **[7M]**

laminar, shear at the location which boundary layer ceases to be laminar and total force on both sides on that portion of plate where the boundary layer is laminar. Take p = 1.2 kg/m3 and v = 1.47x10-5 m 2 /s.

7 a) A jet of water having velocity 20 m/s strikes a curved vane, which is moving with a velocity of 10 m/s. The jet makes an angle of 20º with the direction of motion of vane at inlet and leaves at angle of 130 º to the direction motion of vane at outlet. Calculate (i) Vane angles at inlet. (ii) Work done per sec per unit weight of water per sec. **[7M]**

b) Derive equation for work done and efficiency for a jet impinging on fixed vane at centre. **[7M]**

8 a) Define a centrifugal pump. Explain the working of a single-stage centrifugal pump with sketches. **[7M]**

b) The internal and external diameters of the impeller of a centrifugal pump are 300 mm and 600 mm respectively. The pump is running at 1000 r.p.m. The vane angles at inlet and outlet are 20˚and 30˚ respectively. The water enters the impeller radially and velocity of flow is constant. Determine the work done by the impeller per unit weight of water. **[7M]**

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Code No: R20A0306

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2022

Metallurgy & Material Science

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Answer Any **Five** Questions
All Questions carries equal marks.

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1	a)	Discuss about covalent bond in solids.	**[7M]**
	b)	Discuss Hume-Rotherys rules of solid solubility.	**[7M]**
2	a)	Discuss the mechanism of crystallization.	**[7M]**
	b)	Discuss intermediate alloy phases.	**[7M]**
3	a)	Explain different types of transformations in solid state? Illustrate with an example.	**[10M]**
	b)	Compare any four differences between intermediate phases and solid solutions.	**[4M]**
4	a)	Write equations for the following invariant reactions: peritectic, eutectic, and eutectoid	**[7M]**
	b)	Draw iron-carbon equilibrium diagram and mark on it all salient temperatures, composition and phases involved	**[7M]**
5	a)	Write properties and applications of Tool and Die steels.	**[7M]**
	b)	Explain structure and properties of White cast iron.	**[7M]**
6	a)	What are the types of copper alloy, their composition, properties and applications?	**[7M]**
	b)	Explain in detail the properties and applications of low carbon steel?	**[7M]**
7	a)	Name few ceramic materials which are used in industry and what are their characteristics.	**[7M]**
	b)	Discuss different types of annealing processes.	**[7M]**
8	a)	Explain the method of making composite material by Hand-lay-up technique.	**[7M]**
	b)	What are the properties and applications of metal matrix composites (MMCs)?	**[7M]**

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R20

Code No: R20A0303

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2023

Engineering Mechanics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1	A	State triangle law of forces and polygon law of forces.	**[4M]**
	B	ABCD is a square, each side being 20 cm and E is the middle point of AB. Forces of 7, 8, 12, 5, 9 and 6 kN act on the lines of directions AB, EC, BC, BD, CA and DE respectively. Find the magnitude, direction and position of the resultant force.	**[10M]**
		OR	
2	A	Discuss the various types of equilibrium.	**[4M]**
	B	A light string ABCDE whose extremity A is fixed, has weights W1 and W2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig.1. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W_1 and W_2.	**[10M]**

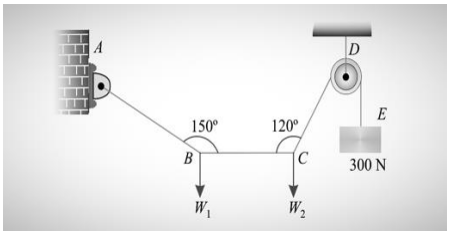

Fig. 1.

SECTION-II

3	A	Explain the term angle of friction.	**[4M]**
	B	A block weighing 1000N is to be raised against a surface inclined at 60 degrees to the horizontal by means of a 15 degrees wedge as shown in Fig.2. Find the horizontal force P which will just start the block to move if the coefficient of friction between all the surfaces of contact be 0.2. Assume the wedge to be negligible weight.	**[10M]**

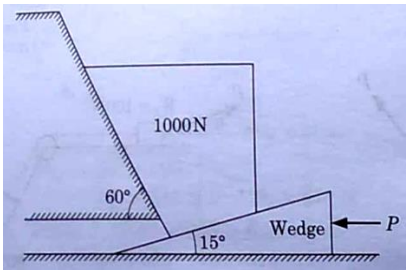

Fig.2.

OR

4 A Write the assumptions, which are made, while finding out the reactions of a beam or a frame having both ends fixed. **[4M]**

B Find the axial forces in the members BC, BG, BF, GC, GF and GE of the truss supported and loaded as shown below. **[10M]**

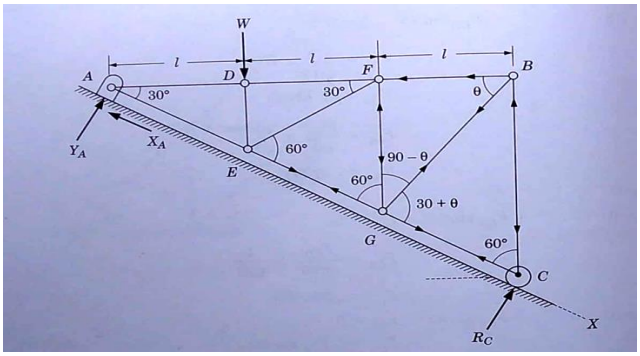

Fig.3.

SECTION-III

5 A Determine the centre of gravity of solid cone of base Radius 'R' and height 'h' **[7M]**

B Distinguish between centre of gravity and centroid. **[7M]**

OR

6 A A semicircular area is removed from a trapezium as shown in Fig.4. (dimensions in mm). Determine the centroid of the remaining area (shown hatched). **[7M]**

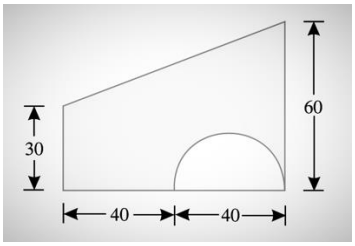

Fig.4.

B A square hole is punched out of circular lamina, the diagonal of the square being the radius of the circle as shown in Fig.5. Find the centre of gravity of the remainder, if r is the radius of the circle. **[7M]**

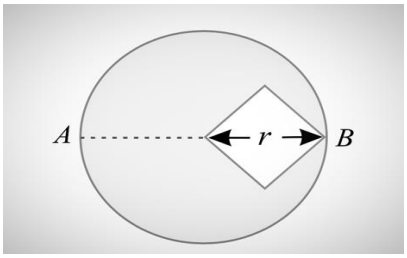

Fig.5.

SECTION-IV

7 Find the moment of inertia about the horizontal centroidal axis. **[14M]**

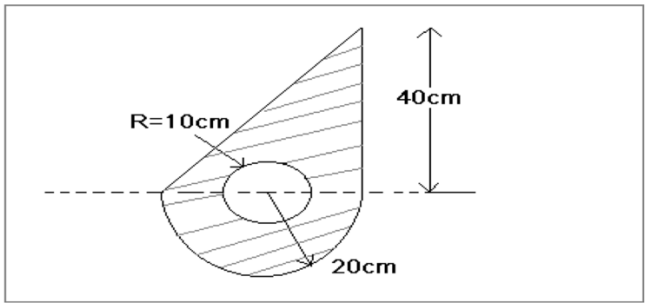

Fig.6.

OR

8 A How would you find out the moment of inertia of a plane area ? **[4M]**

B A rectangular hole is made in a triangular section as shown in Fig. 7. Determine the moment of inertia of the section about X-X axis passing through its centre of gravity and the base BC. **[10M]**

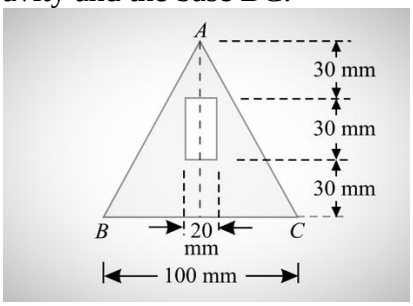

Fig. 7.

SECTION-V

9 A Derive the Expression for the Equations of motion of the body when it is accelerated uniformly. **[7M]**

B Two bodies of masses 45 and 30 kg are hung to the ends of a rope, passing over a frictionless pulley. With what acceleration the heavier mass comes down? What is the tension in the string? **[7M]**

OR

10 A A particle, starting from rest, moves in a straight line, whose equation of motion is given by : $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds. **[7M]**

B The equation of motion of an engine is given by $s = 2t^3 - 6t^2 - 5$, where (s) is in metres and (t) in seconds. Calculate (i) displacement and acceleration when velocity is zero ; and (ii) displacement and velocity when acceleration is zero. **[7M]**

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R20

Code No: R20A0304

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2023

Engineering Thermodynamics

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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Note:Steam Tables and psychometric charts permitted

SECTION-I

1	***A***	Define Thermodynamic system and explain types of systems with engineering examples.	**[6M]**
	B	A gas undergoes a thermodynamic cycle consisting of the following processes: (i) Process 1–2: Constant pressure p= 1.4 bar, V_1 = 0.028 m^3, W_{12} = 10.5 kJ (ii) Process 2–3: Compression with pV = constant, $U_3 = U_2$ (iii) Process 3–1: Constant volume, $U_1 - U_3 = -26.4$ kJ. There are no significant changes in KE and PE. Sketch the cycle on a p–V diagram, Calculate the net-work for the cycle in kJ, Calculate the heat transfer for process 1–2 and Show that ΣQ=ΣW?	**[8M]**

OR

2	***A***	Apply steady flow energy equation for i) steam nozzle ii) An evaporator iii) Throttling valve, and iv) gas turbine	**[6M]**
	B	A turbine operates under steady flow conditions, receiving steam at the following state: Pressure 1.2 MPa, temperature 188°C, enthalpy 2785 kJ/kg, velocity 33.3 m/s and elevation 3 m. The steam leaves the turbine at the following state: Pressure 20 kPa, enthalpy 2512 kJ/kg, velocity 100 m/s, and elevation 0 m. Heat is lost to the surroundings at the rate of 0.29 kJ/s. If the rate of steam flow through the turbine is 0.42 kg/s, what is the power output of the turbine in kW	**[8M]**

SECTION-II

3	***A***	Explain the working of Carnot cycle with neat sketch? And Derive an expression for Carnot Efficiency?	**[6M]**
	B	A reversible heat engine operates between two reservoirs at 827ºC and 27ºC. Engine drives a Carnot refrigerator maintaining –13ºC and rejecting heat to reservoir at 27ºC. Heat input to the engine is 2000 kJ and the network available is 300 kJ. How much heat is transferred to refrigerant and total heat rejected to reservoir at 27ºC?	**[8M]**

OR

4	***A***	How the available energy decreases when heat is transferred through a finite temperature difference? Explain?	**[7M]**
	B	Two Carnot engines work in series between the sources and sink temperatures of 500 K and 300 K. If both engines develop equal power determine the intermediate temperature.	**[7M]**

SECTION-III

5	***A***	Explain entropy is a property of a sysem.	**[7M]**
	B	Determine the final condition of steam, work done, heat transferred and change in entropy if 0.5 kg of steam at 1 MPa and 0.8 dry is heated at constant pressure until its volume gets doubled.	**[7M]**

OR

6	***A***	Explain the differences between Throttling and Free Expansion processes with examples.	**[7M]**
	B	Using P-V-T data for saturated water, calculate at 100^{o}C, (i) h_{fg}, (ii) u_{fg}, and (iii) s_{fg}. Compare the results with respective steam table values. (Use Clausius Clapeyron equation if needed).	**[7M]**

SECTION-IV

7	***A***	Discuss about Mass fraction Gravimetric and volumetric Analysis.	**[7M]**
	B	For the atmospheric air at room temperature of 30^{o}C and relative humidity of 60% determine partial pressure of air, humidity ratio, dew point temperature, density and enthalpy of air.	**[7M]**

OR

8	***A***	Explain dry bulb temperature, wet bulb temperature, dew point temperature, thermodynamic wet bulb temperature.	**[7M]**
	B	The air in a room has a pressure of 1 atm, a dry-bulb temperature of 24°C, and a wet-bulb temperature of 17°C. Using the psychrometric chart, determine (*a*) the specific humidity, (*b*) the enthalpy (in kJ/kg dry air), (*c*) the relative humidity, (*d*) the dew-point temperature, and (*e*) the specific volume of the air (in m^3/kg dry air).	**[7M]**

SECTION-V

9	***A***	Derive the expression for air standard efficiency and mean effective pressure of diesel cycle with the help of P-V diagram.	**[7M]**
	B	In an air-standard Otto cycle, the compression ratio is 11. The condition at the beginning of the compression process is 101kPa and 25^{o}C. Heat added at constant volume is 1600 kJ/kg, while 720 kJ/kg of heat is rejected during the other constant volume process in the cycle. Specific gas constant for air R= 0.287kJ/kg/K. Determine the mean effective pressure (in kPa).	**[7M]**

OR

10	***A***	Derive the efficiency of Brayton cycle with the help of P-V and T-s diagrams.	**[7M]**
	B	A Brayton cycle producing 75 kW is designed for maximum work. The compressor inlet conditions are 100 kPa and 27^{o}C. Compression ratio is 5.5. For air standard Brayton cycle determine the turbine inlet temperature, cycle efficiency and air flow rate.	**[7M]**

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R20

Code No: R20A0305

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2023

Fluid Mechanics & Hydraulic Machinery

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1	***A***	Explain the classification of different types of manometers.	**[7M]**
	B	Two large fixed parallel planes are 12mm apart. The space between the surfaces is filled with an oil of viscosity 0.9 N s/m^2. A flat thin plate 0.2 m^2 area moves through the oil at a velocity of 0.25 m/s.	**[7M]**
		OR	
2	***A***	What devices are used for the measurement of vacuum pressures?	**[7M]**
	B	State the Newton's Law of viscosity and give examples of its application	**[7M]**

SECTION-II

3	***A***	Define velocity potential function and Force potential	**[4M]**
	B	Explain the different types of fluid flows.	**[10M]**
		OR	
4	***A***	How is a body force different from surface force?	**[4M]**
	B	Explain and differentiate between streak line and stream line	**[10M]**

SECTION-III

5	***A***	List various minor losses in pipe flow	**[4M]**
	B	An orifice meter with orifice diameter 16 cm is inserted in a pipe of 32 cm diameter. The pressure difference measured by a mercury oil differential manometer on the two sides of the orifice meter gives a reading of 60 cm of mercury. Find the rate of flow of oil of specific gravity 0.9 when the coefficient of discharge of the orifice meter is 0.70.	**[10M]**
		OR	
6	***A***	For flow through a venturi meter, obtain the relation for flow rate measurement. Explain its working principle.	**[7M]**
	B	Explain the concept of equivalent pipe when many pipes are connected in series	**[7M]**

SECTION-IV

7	***A***	Sketch Kaplan turbine and mention various parts in it.	**[4M]**
	B	Determine the power developed by the Pelton turbine when the jet strikes with a tangential velocity 25 m/sec. The net head on the turbine is 60m and discharges through the jet of water are 0.05m^3/sec. the blade outlet angle is 20° and coefficient of velocity is 0.98	**[10M]**

OR

8	***A***	Write the classification of hydraulic turbines	**[7M]**
	B	Sketch different types of draft tubes & derive the expression for the efficiency of draft tube	**[7M]**

SECTION-V

9	***A***	What are the effects of cavitation in centrifugal pumps	**[4M]**
	B	A double acting reciprocating pump, running at 40 rpm is discharging 1 m^3 of Water per minute. The pump has a stroke of 400 mm. The diameter of the piston is 200 mm. The delivery and suction head are 20 m and 5 m respectively. Find the slip of the pump and power required to drive the pump	**[10M]**

OR

10	***A***	Derive the expression for the work done by a reciprocating pump and explain working with neat sketch.	**[10M]**
	B	Briefly discuss the significance of NPSH	**[4M]**

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Code No: R20A0306 **R20**

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2023

Metallurgy & Material Science

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

1	***A***	Discuss metallic bond in solids with an example.	**[7M]**
	B	Discuss Screw dislocation with a neat sketch.	**[7M]**
		OR	
2	***A***	State Home-Rothery's rules of solid solubility.	**[7M]**
	B	What is the necessity of alloying? Discuss electron compound.	**[7M]**

SECTION-II

3	***A***	List and explain three reactions present in the Fe-Fe_3C equilibrium diagram.	**[7M]**
	B	Discuss the method of construction of equilibrium diagram.	**[7M]**
		OR	
4	***A***	Write the equations for the following reactions: eutectic, peritectic, eutectoid and peritectoid in binary phase diagram.	**[7M]**
	B	Draw Cu-Ni phase diagram and label the important reactions and regions?	**[7M]**

SECTION-III

5	***A***	Explain about Nodular cast iron with its micro structure and applications.	**[7M]**
	B	Which stainless steel is best suited for surgical instruments? Explain.	**[7M]**
		OR	
6	***A***	Discuss the properties and applications of Aluminium.	**[7M]**
	B	Write the properties of beta titanium alloys.	**[7M]**

SECTION-IV

7	***A***	Explain hardening and Tempering processes.	**[7M]**
	B	Explain about packed carburizing process.	**[7M]**
		OR	
8	***A***	How do you find the Hardenability? Explain.	**[7M]**
	B	What are cerments? Explain with examples.	**[7M]**

SECTION-V

9	***A***	Discus various types of Fibrous materials used in polymer composites.	**[7M]**
	B	Write a short notes on types of composite materials	**[7M]**
		OR	
10	***A***	Discuss the method of making steel using crucible process.	**[7M]**
	B	Discuss the various steps involved in powder metallurgy.	**[7M]**

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Code No: **R20A0308**

R20

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, July/August 2023

Theory of Machines

(ME)

Roll No										

Time: 3 hours **Max. Marks: 70**

Note: This question paper Consists of 5 Sections. Answer **FIVE** Questions, Choosing ONE Question from each SECTION and each Question carries 14 marks.

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SECTION-I

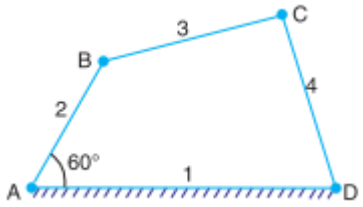
1	***A***	In a slotted lever quick-return mechanism, the distance between fixed centres is 200 mm and driving crank is 100 mm long. Determine the ratio of the time taken on the cutting and return strokes.	**[7M]**
	B	Explain the types of partially and completely constrained motions with examples.	**[7M]**

OR

2		With neat diagrams explain the working of any two inversions of a single slider crank chain.	**[14M]**

SECTION-II

3		Locate all the instantaneous centres for a four bar mechanism as shown in Fig. The lengths of various links are : AD = 125 mm ; A B = 62.5 mm ; BC = CD = 75 mm. If the link A B rotates at a uniform speed of 10 r.p.m. in the clockwise direction, find the angular velocity of the links BC and CD.	**[14M]**



OR

4	***A***	What are the conditions for correct steering and explain with a sketch the working of Davis steering gear	**[7M]**
	B	In a Davis steering gear, the distance between the pivots of the front axle is 1 metre and the wheelbase is 2.5 metres. Find the inclination of the track arm to the longitudinal axis of the car, when it is moving along a straight path.	**[7M]**

SECTION-III

5		Explain the stability of a Four-Wheel motor car Moving in a Curved Path with a neat sketch.	**[14M]**

OR

6	***A***	Discuss the turning moment diagram of a multicylinder engine.	**[7M]**
	B	Explain the turning moment diagram of a four-stroke cycle internal combustion engine.	**[7M]**

SECTION-IV

7 A centrifugal clutch is to transmit 15 kW at 900 r.p.m. The shoes are four in number. The speed at which the engagement begins is 3/4th of the running speed. The inside radius of the pulley rim is 150 mm and the centre of gravity of the shoe lies at 120 mm from the centre of the spider. The shoes are lined with Ferrodo for which the coefficient of friction may be taken as 0.25. Determine : 1. Mass of the shoes, and 2. Size of the shoes, if angle subtended by the shoes at the centre of the spider is 60^o and the pressure exerted on the shoes is 0.1 N/mm^2 **[14M]**

OR

8 Describe with the help of a neat sketch the principles of operation of an internal expanding shoe brake. Derive the expression for the braking torque. **[14M]**

SECTION-V

9 A cam rotating in clockwise direction at a uniform speed of 1000 rpm is required to give a roller follower the motion defined below: **[14M]**

a) Follower moves outwards through 50 mm during 120^0 of cam rotation.
b) Follower dwells for next 60^0 of cam rotation
c) Follower returns to its original position during next 90^0 of cam rotation
d) Follower dwells for rest of cam rotation

The minimum radius of the cam is 50 mm and the diameter of roller is 10 mm. The line of stroke of follower is off-set by 20 mm from the axis of the cam shaft. If the displacement of the follower is to take place with SHM on both the strokes, draw the profile of the cam. Also determine the maximum velocity and acceleration during the outwards and return strokes

OR

10 ***A*** Calculate the vertical height of a Watt governor when it rotates at 62 r.p.m. Also find the change in vertical height when its speed increases to 64 r.p.m **[7M]**

B Explain the term height of the governor. Derive an expression for the height in the case of a Watt governor. What are the limitations of a Watt governor ? **[7M]**

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