MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL **R18**

(Autonomous Institution – UGC, Govt. of India)
II B.Tech I Semester Supplementary Examinations, June/July 2024
Thermodynamics
(ME)

Roll No										

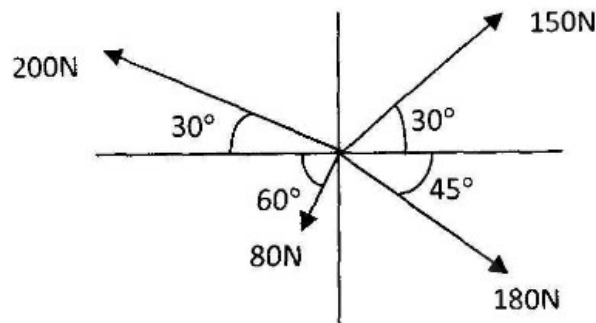**Time: 3 hours**   **Max. Marks: 70**

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

***

SECTION-I

1 **A** Describe briefly about the system and types of system. **[7M]**

B A closed system of constant volume experiences a temperature rise of 25°C when a certain process occurs. The heat transferred in the process is 30 kJ. The specific heat at constant volume for the pure substance comprising the system is 1.2 kJ/kg°C, and the system contains 2.5 kg of this substance. Determine: (i) The change in internal energy ; (ii) The work done **[7M]**

OR

2 **A** With a neat sketch explain briefly about Joule's experiment. **[7M]**

B A fluid system, contained in a piston and cylinder machine, passes through a complete cycle of four processes. The sum of all heat transferred during a cycle is -340 kJ. The system completes 200 cycles per minute. Complete the following table showing the method for each item and compute the net rate of work output in Kw. **[7M]**

Process	Q (kJ/min)	W (kJ/min)	ΔE (kJ/min)
1-2	0	4340	
2-3	42000	0	
3-4	-4200		73200
4-1			

SECTION-II

3 **A** State the limitations of second law of thermodynamics. Explain second law of thermodynamics with its corollaries. **[7M]**

B 2kg of air at a pressure of 7 bar occupies a volume of $0.28m^3$ This air is then expanded to a volume of $1.4m^3$. This expansion takes place according to the law $pV1.2$ = constant. Find work done, change in internal energy, heat absorbed or rejected during the process, change in enthalpy and change in entropy during the process. For air Cp = 1 kJ/kgK and Cv = 0.72 kJ/kg K **[7M]**

OR

4 **A** Show that the efficiency of a reversible engine is greater than an irreversible engine operating between two given constant temperatures. **[6M]**

B Derive an expression for availability function of a closed system. **[8M]**

SECTION-III

5 **A** What are the Perfect Gas Laws, and how are they represented by the Equation of State? Provide examples of perfect gases. **[7M]**

B Steam initially at 1.5MPa, 300°C expands adiabatically in steam turbine to 40 °C. Determine the work output of the turbine per kg of steam. **[7M]**

6 **A** A vessel of volume 0.04 m³ contains a mixture of saturated water and saturated steam at a temperature of 250°C. The mass of the liquid resent is 9kg. Find the pressure, mass, specific volume, entropy, enthalpy and internal energy **[7M]**

B Calculate the entropy and internal energy of a steam at a pressure of 12 bar i) When the steam is having a dryness fraction of 0.8. ii) When the steam is saturated and iii) When the steam is super heated to a degree of super heat of 20°C. **[7M]**

SECTION-IV

7 **A** Describe the relationship between mole fraction, volume fraction, and partial pressure in a gas mixture. How are these parameters interrelated? **[7M]**

B Define the following terms i) Dry bulb temperature ii) Wet bulb temperature iii) Dew point temperature iv) Relative humidity. **[7M]**

OR

8 **A** Describe the relationship between mole fraction, volume fraction, and partial pressure in a gas mixture. How are these parameters interrelated? **[7M]**

B A constant volume chamber of 0.4 m³ capacity contains 1 kg of air at 8°C. Heat is transferred to the air until the temperature is 120°C. Find the work done, the heat transferred, and the changes in internal energy, enthalpy and entropy. **[7M]**

SECTION-V

9 **A** Derive the expression for efficiency of Otto cycle on P - V and T -S diagrams **[7M]**

B A mass of 1kg of air is taken through a Diesel cycle initially the air is at 15°C and 1 bar. The compression ratio is 1 and the heat supplied is 1850kJ. Calculate the ideal cycle efficiency and mean effective pressure. Assume R=0.287kJ/kgK , Cp=1.005 kJ/kgK and γ=1.4. **[7M]**

OR

10 **A** Derive the expressions for the thermal efficiency and mean effective pressure of an Diesel cycle. **[7M]**

B A n engine operating on ideal Otto cycle has a compression ratio of 9:1. At the beginning of the compression stroke air is at 101.5kN/m² and 315K. if the heat supplied is 940kJ/kg of air, Calculate the maximum pressure and the temperature in the cycle and the efficiency. Assume Cv=0.718kJ/kgK and γ=1.4. **[7M]**

*****

R18

MALLA REDDY COLLEGE OF ENGINEERING & TECHN
(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: 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**   State and prove Lame's theorem?   **[4M]**
   B   Determine the resultant of concurrent forces shown in the figure below.   **[10M]**

OR

2   **A**   What is meant by Free Body Diagram? Explain with an example.   **[4M]**
   B   Three bars, pinned together B and C and supported by hinges at A and D as   **[10M]**
        shown in figure below form a four - link mechanism. Determine the value of
        P that will prevent motion.

SECTION-II

3   **A**   Define the following terms: (i) Limiting Friction,(ii) Cone of friction   **[6M]**
   B   A rope is used to lift a 100N weight using locked pulley as shown in figure.   **[8M]**
        If f_s= 0.30, determine force P necessary to begin lifting the load.

OR

4 **A** Obtain the relation between no. of members and joints? **[4M]**

  B Determine the forces in the all the members of the truss and as shown below figure and tabulate the results **[10M]**

SECTION-III

5 **A** State and prove theorem of Pappus – I & II. **[7M]**

  B Locate the centroid of the shaded area shown in figure **[7M]**

OR

6 **A** Distinguish between centriod and centre of gravity **[4M]**

  B Locate the centroid of the shaded area and also find the moment of inertia about horizontal centroidal axis shown in figure. All dimensions in mm. **[10M]**

SECTION-IV

7 Determine the moment of inertia of the section shown in Fig below with respect to the Centroidal X and Y axes. **[14M]**

OR

8   **A**   Determine the area moment of inertia of a rectangle with dimensions b x h about the base b   **[7M]**

       B   Determine the mass moment of inertia of a solid sphere of radius "R" about its diametral axis.   **[7M]**

SECTION-V

9   **A**   Blocks A and B weighing 500 N and 1500 N respectively are connected by a weightless rope passing over a frictionless pulley as shown in the figure. The coefficient of friction is 0.3 on all contact surfaces. Determine the following using D'Alembert's principle: i) Tension in the rope. ii) Velocity of the system 5 sec after starting from rest.   **[7M]**

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

OR

10   Referring to Fig assume A weigh 900 N B weighs 300N. Determine the acceleration of the bodies if the coefficient of kinetic friction is 0.1 between the cable and the fixed drum   **[14M]**

***

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL **R18**

(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: 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** A 400 mm diameter shaft is rotating at 200 r.p.m. in a bearing of length 120 mm. **[7M]** If the thickness of oil film is 1.5 mm and the dynamic viscosity of the oil is 0.7 N.s/m², determine:
(i) Torque required to overcome friction in bearing;
(ii) Power utilised in overcoming viscous resistance. Assume a linear velocity profile.

B What is the difference between U-tube differential Manometers and inverted **[7M]** U-tube differential Manometers? Where are they used?

OR

2 **A** Explain briefly the following mechanical gauges with the help of neat sketches **[8M]**
(i) Piezometer
(ii) U-tube manometer.

B U-tube manometer containing mercury was used to find the negative pressure **[6M]** in the pipe, containing water. The right limb was open to the atmosphere. Find the vacuum pressure in the pipe, if the difference of mercury level in the two limbs was 100 mm and height of water in the left limb from the centre of the pipe was found to be 40 mm below

SECTION-II

3 **A** The diameters of a pipe at the sections 1-1and 2-2 are 200 mm and 300 mm **[7M]** respectively. If the velocity of water flowing through the pipe at section 1-1 is 4m/s, find:
(i) Discharge through the pipe, and
(ii) Velocity of water at section 2-2

B Define and distinguish between: **[7M]**
    i)   Uniform flow and non-uniform flow
    ii)   Laminar and turbulent flow

OR

4 **A** Water flows in a circular pipe. At one section the diameter is 0.3 m, the static **[7M]** pressure is 260 kPa gauge, the velocity is 3 m/s and the elevation is 10 m above ground level. The elevation at a section downstream is 0 m, and the pipe diameter is 0.15 m. Find out the gauge pressure at the downstream section. Frictional effects may be neglected. Assume density of water to be 999 kg/m3.

B A 6m long pipe is inclined at an angle of 20° with the horizontal. The smaller **[7M]** section of the pipe which is at lower level is of 100 mm diameter and the larger section of the pipe is of 300 mm diameter as shown in Fig. 6.10. If the pipe is uniformly tapering and the velocity of water at the smaller section is 1.8 m/s, determine the difference of pressures between the two sections

SECTION-III

5 **A** What do you understand by total energy line, hydraulic line, pipes in parallel, pipes in series and equivalent pipe? Explain **[7M]**

    B Define the following terms: **[7M]**
(i) Laminar boundary layer
(ii) Turbulent boundary layer
(iii) Laminar sublayer
(iv) Boundary layer thickness

<p align="center">OR</p>

6 **A** In a pipe of 300 mm diameter and 800 m length an oil of specific gravity 0.8 is flowing at the rate of 0.45 m3/s. Find : **[7M]**
(i) Head lost due to friction, and
(ii) Power required to maintain the flow. Take kinematic viscosity of oil as 0.3 stoke.

    B Describe an orificemeter and find an expression for measuring discharge of fluid through a pipe with this device? Why is co-efficient of discharge of an orificemeter much smaller than that of venturimeter? **[7M]**

SECTION-IV

7 **A** A jet of water of 20 mm diameter and moving at 15 m/s, strikes upon the centre of a symmetrical vane. After impingement, the jet gets deflected through 160° by the vane. Presuming vane to be smooth determine: **[7M]**
(i) The force exerted by jet on the vane, and
(ii) The ratio of velocity at outlet to that at inlet if actual reaction of the vane is 127 N.

    B A jet of water, 60 mm in diameter, strikes a curved vane at its centre with a velocity of 18 m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate to be smooth, find: **[7M]**
(i) Thrust on the plate in the direction of jet,
(ii) Power of the jet, and
(iii) Efficiency of the jet

<p align="center">OR</p>

8 **A** The water available for a Pelton wheel is 4 m³/s and the total head from the reservoir to the nozzle is 250 m. The turbine has two runners with two jets per runner. All the four jets have the same diameters. The pipe is 3 km long. The efficiency of transmission through the pipeline and the nozzle is 91% and efficiency of each runner is 90%. The velocity co-efficient of each nozzle is 0·975 and co-efficient of friction '4f' for the pipe is 0.0045. Determine : **[7M]**
(i) The power developed by the turbine,
(ii) The diameter of the jet, and
(iii) The diameter of the pipeline.

    B Explain the term cavitation. Why does cavitation occur and what are its effects? **[7M]**

SECTION-V

9 **A** Why are centrifugal pumps used sometimes in series and sometimes in parallel ? Draw the following characteristic curves for a centrifugal pump: **[7M]**

    B A centrifugal pump running at 800 r.p.m. is working against a total head of 20.2 m. The external diameter of the impeller is 480 mm and outlet width 60 mm. If the vanes angle at outlet is 40° and manometric efficiency is 70 percent, determine: **[7M]**
(i) Flow velocity at outlet,
(ii) Absolute velocity of water leaving the vane,
(iii) Angle made by the absolute velocity at outlet with the dircetion of motion at outlet, and

(iv) Rate of flow through the pump.

<div align="center">OR</div>

10   *A*   Draw an indicator diagram, considering the effect of acceleration and friction in suction and delivery pipes. Find an expression for the work done per second in case of a single-acting reciprocating pump   **[7M]**

     B   A single-acting reciprocating pump has a diameter (piston) of 150 mm and stroke length 350 mm. The centre of the pump is 3.5 m above the water surface in the sump and 22 m below the delivery water level. Both the suction and delivery pipes have the same diameter of 100 mm and are 5 m and 30 m long respectively. If the pump is working at 30 r.p.m., determine: **[7M]**

(i) The pressure heads on the piston at the beginning, middle and end of both suction and delivery strokes.

(ii) The power required to drive the pump. Take atmospheric pressure as 10.3 m of water.

<div align="center">****</div>

R18

MALLA REDDY COLLEGE OF ENGINEERING & TECHNO
(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: 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** What is the significance of degrees of freedom of a kinematic chain when it functions as a mechanism? Give examples.   **[7M]**

B Explain the working of any two inversions of a single slider crank chain with neat sketches.   **[7M]**

OR

2 **A** What is a machine? In what way a mechanism differ from a machine? Explain.   **[7M]**

B A double slider mechanism is used to draw an ellipse with major axis equal to 20 cm and minor axis 15 cm. Set out the mechanism, and draw the locus of the points tracing the required ellipse.   **[7M]**

SECTION-II

3 **A** Sketch a pantograph, explain its working and show that it can be used to reproduce to an enlarged scale a given figure.   **[7M]**

B What are straight line mechanisms? Describe one type of exact straight line motion mechanism with the help of a sketch.   **[7M]**

OR

4 **A** With a neat sketch, explain the Davis steering gear mechanism in detail.   **[7M]**

B Two shafts are connected by universal Hooke's joint. The driving shaft rotates at uniform speed of 1200 rpm. Determine the greatest permissible angle between the shaft axis so that the total fluctuation of speed does not exceed 100 rpm and also calculate the maximum and minimum speeds of driven shaft.   **[7M]**
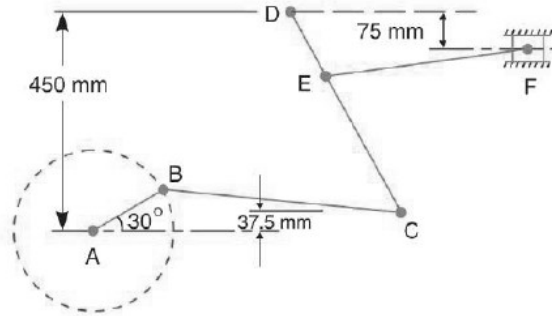
SECTION-III

5 Draw and explain the KLEIN's construction for the velocity diagram of a Reciprocating Engine Mechanism? With this construction, how do you find the velocities of the piston and connecting rod in terms of the uniform angular velocity of the crank?   **[14M]**

OR

6 In a link work, as shown in Fig. the crank AB rotates about A at a uniform speed of 150 r.p.m. The lever DC oscillates about the fixed point D, being connected to AB by the connecting link BC. The block F moves, in horizontal guides being driven by the link EF, when the crank AB is at 30°. The dimensions of the various links are: AB= 150 mm; BC= 450 mm; CE= 300 mm ; DE= 150 mm ; and EF= 350 mm. Find, for the given configuration, 1. velocity of slider F, 2. angular velocity of DC, and 3.   **[14M]**

Rubbing speed at pin C which is 50 mm in diameter.

SECTION-IV

7 **A** Compare the performance of Knife –edge, roller and roller followers with neat sketches. **[6M]**

B Draw a cam profile which would impart motion to a flat faced follower in the following desired way. The stroke of the follower being 5 cm. (i) The follower to move with uniform acceleration upward for 900 , dwell for next 900, (ii) The follower to return downward with uniform retardation for 1200 and dwell for next 600. The minimum radius of the cam being 3 cm. **[8M]**

OR

8 A cam is to be designed for a knife edge follower with the following data : (1) Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion. (2) Dwell for the next 30°. (3) During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion. (4) Dwell during the remaining 180°. **[14M]**

Draw the profile of the cam when, (a) the line of stroke of the follower passes through the axis of the cam shaft, and (b) the line of stroke is offset 20 mm from the axis of the cam shaft. The radius of the base circle of the cam is 40 mm. Determine the maximum velocity and acceleration of the follower during its ascent and descent, if the cam rotates at 240 r.p.m.

SECTION-V

9 **A** Sketch two teeth of a gear and show the following: face, flank, top land, bottom land, addendum, dedendum, tooth thickness, space width, face width and circular pitch. **[7M]**

B Derive a relation for minimum number of teeth on the gear wheel and the pinion to avoid interference. **[7M]**

OR

10 **A** Derive the expression for the velocity ratio of a compound gear train. **[7M]**

B The arm of an epicyclic gear train rotates at 100 rpm anti-clockwise. The arm carries two wheels A and B, having 36 and 45 teeth respectively, and meshing with each other. Wheel A makes 200 rpm clockwise, and the arm rotates about the center of wheel A. Find the speed of wheel B. **[7M]**

***

R18

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

Roll No									

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

Note: This question paper Consists of 2 parts. Answer **two** Questions from PART-A which carries 15 marks each and PART-B is compulsory question which carries 40 Marks

***

Part- A (30 Marks)
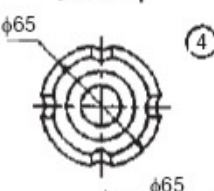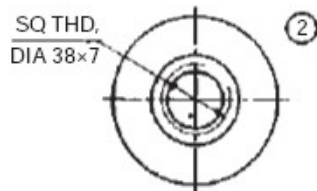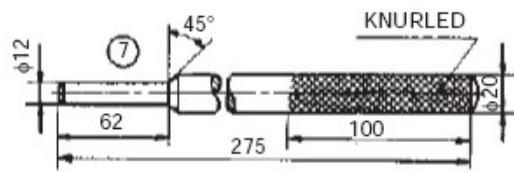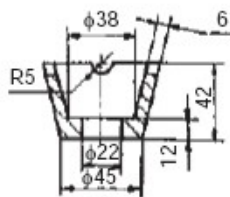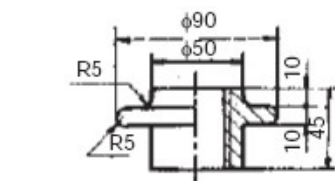**Answer any two of the following**   **(15*2=30)**

Q. No. 1. Sketch the method of dimensioning chamfers and countersunks.
Q. No. 2. Draw (*a*) half sectional view from the front, top half in section and (*b*) view from the side of a rigid flange coupling to connect two shafts, each of diameter 30 mm.
Q. No. 3. Draw (*a*) sectional view from the front and (*b*) view from above, of the following riveted joints, to join plates of thickness 10 mm: (*i*) single riveted lap joint, (*ii*) double riveted chain lap joint.

Part-B (40 Marks)

Q. No.4 Assemble all parts of the screw jack, shown in Fig and draw the following views:
  (*i*) Half sectional view from the front, and (*ii*) View from above.   **(1*40=40M)**

Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Nut	GM	1
3	Screw	MS	1
4	Cup	CS	1
5	Washer	MS	1
6	Screw	MS	1
7	Tommy bar	MS	1

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOL
(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: 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	Explain Basic Cubic Structure with a neat sketch.	[7M]
	B	Define Bravais lattice and Explain any One in Detail with sketch.	[7M]

OR

2	A	Write any 4 differences between Ionic and Covalent bond.	[8M]
	B	What is the Physical significance of crystal directions ?	[6M]

SECTION-II

3	A	Describe and illustrate the solidification process of pure metals in terms of nucleation and grain growth.	[8M]
	B	Explain Phase diagram of Isomorphous systems.	[6M]

OR

4	A	Explain Hume-rothery's rules of Solid Solubility.	[8M]
	B	What is Powder Metallurgy? Explain about the process briefly.	[6M]

SECTION-III

5	A	Write about Ferrous alloys and their applications.	[8M]
	B	Explain the various stages in a heat treatment cycle.	[6M]

OR

6	A	Describe the following cast irons: i) Malleable cast iron ii) Grey cast iron	[8M]
	B	Explain the process of Quenching.	[6M]

SECTION-IV

7	A	Explain about Cermets and write their applications.	[6M]
	B	Write any FOUR Application of composites in electrical and mechanical components	[8M]

OR

8	A	Explain about glass and its manufacturing process.	[9M]
	B	What is dispersion strengthened materials?	[5M]

SECTION-V

9	A	Explain briefly about Polymers and Classify them.	[7M]
	B	Write about Photonic polymers.	[7M]

OR

10	A	Explain briefly about Engineering Plastics.	[6M]
	B	Write any 4 differences between Thermosets and Thermoplastics.	[8M]

***