



OR

- 8 *A* What are the various types of the brakes and explain the single block or shoe brake. [7M]
- B* A bicycle and rider of mass 100 kg are travelling at the rate of 16 km/h on a level road. A brake is applied to the rear wheel which is 0.9 m in diameter and this is the only resistance acting. How far will the bicycle travel and how many turns will it make before it comes to rest? The pressure applied on the brake is 100 N and  $\mu = 0.05$ . [7M]

**SECTION-V**

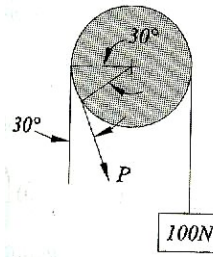
- 9 Use the following data in drawing the profile of a cam in which a knife-edged follower is raised with uniform acceleration and deceleration and is lowered with simple harmonic motion: [14M]
- Least radius of cam = 60 mm  
Lift of follower = 45 mm  
Angle of ascent =  $60^\circ$   
Angle of dwell between ascent and descent =  $40^\circ$   
Angle of descent =  $75^\circ$
- If the cam rotates at 180 rpm, determine the maximum velocity and acceleration during ascent and descent.

OR

- 10 *A* Explain the term height of the governor. Derive an expression for the height in the case of a Watt governor. [7M]
- B* A Porter governor has equal arms each 250 mm 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. [7M]

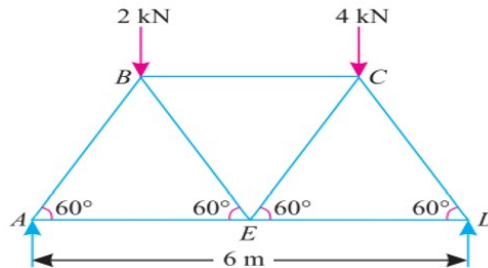
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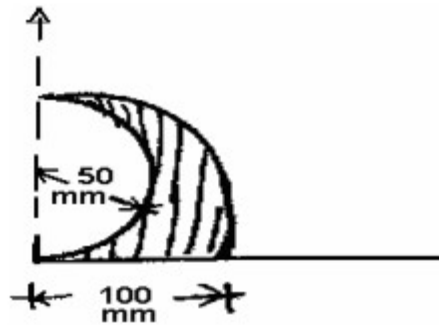
OR

- 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]



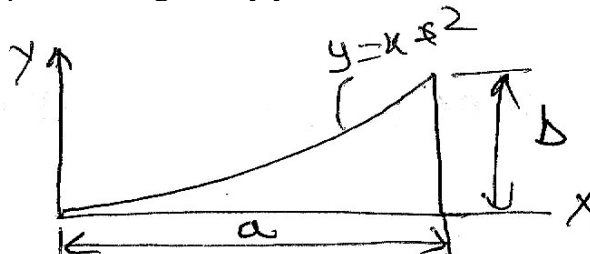
**SECTION-III**

- 5 **A** State and prove theorem of Pappus - I. [7M]  
**B** Locate the centroid of the shaded area shown in figure [7M]



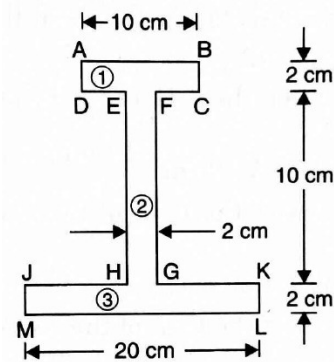
OR

- 6 **A** Distinguish between centroid and centre of gravity [4M]  
**B** Determine the centroid of the parabolic spandrel as shown in figure 5. The equation of the parabola is given by  $y=kx^2$ . [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

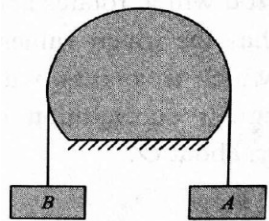
- 8 **A** Determine the area moment of inertia of a rectangle with dimensions  $b \times h$  about the base  $b$  [7M]  
**B** Determine the mass moment of inertia of a solid sphere of radius "R" about its diametral axis. [7M]

**SECTION-V**

- 9 Two guns are pointed at each other one upward at an angle  $30^\circ$  and the other at the same angle of depression, the muzzles being 20 m apart. If the guns are shot with velocities of 350 m/s upwards and 300 m/s downwards respectively. Find when and where they will meet? [14M]

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]



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Code No: R20A0304

**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**II B.Tech I Semester Supplementary Examinations, June/July 2024****Engineering Thermodynamics****(ME)**

<b>Roll No</b>									
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**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 what do you mean by thermodynamics equilibrium. [7M]  
**B** Differentiate between intensive and extensive properties. Give examples in each case. [7M]

OR

- 2 **A** A Piston and cylinder machine contains a fluid system which passes through a complete cycle of *four* processes. During a cycle, the sum of all heat transfers is -170kJ. The systems completes 100 cycles per min. Complete the following table showing the method for each item, and compute the net rate of work output in kW. [7M]

Process	Q	W (kJ/min)	U (kJ/min)
a-b	0	2170	-
b-c	21000	0	-
c-d	2100	-	-36600
d-a	-	-	-

- B** Write down the steady flow energy equation *for* [7M]  
a)Boiler b) Turbine c) Nozzle d) Compressor

**SECTION-II**

- 3 **A** Explain about heat engine and heat pump. [7M]  
**B** A refrigerator transfers energy as heat from a low temperature body to the ambient atmosphere at high temperature. Does it violate second law of thermodynamics? Explain. [7M]

OR

- 4 **A** A system has a heat capacity at constant volume  $C_v = AT^2$  Where  $A = 0.042 \text{ J/K}^3$  The system is originally at 200K, and a thermal reservoir at 100K is available. What is the maximum amount of work that can be recovered as the system is cooled down to the temperature of the reservoir? [7M]

- B** Can the efficiency of an irreversible engine be greater than that of a reversible engine? Explain. [7M]

**SECTION-III**

- 5 **A** A vessel of volume  $0.04 \text{ m}^3$  contains a mixture of saturated water and saturated steam at a temperature of  $250^\circ \text{C}$ . The mass of the liquid present is 9 kg. Find the pressure, the mass, the specific volume, the enthalpy, the entropy, and the internal energy. [7M]

- B** Explain the terms critical pressure, critical temperature and critical volume of water. [7M]

OR

- 6 *A* Steam initially at 0.3 MPa, 250° C is cooled at constant volume. (a) At what temperature will the steam become saturated vapour? (b) What is the quality at 80°C? What is the heat transferred per kg of steam in cooling from 250° C to 80°C? [7M]
- B* Explain about Throttling and free expansion process. [7M]

**SECTION-IV**

- 7 *A* What is meant by partial volume of constituent in a mixture. [4M]
- B* A single - acting two-stage air compressor deals with 4 m<sup>3</sup>/ min of air at 1.013 bar and 15° C with a speed of 250 rpm. The delivery pressure is 80 bar. Assuming complete intercooling, find the minimum power required by the compressor and the bore and stroke of the compressor. Assume a piston speed of 3 m/s, mechanical efficiency of 75 % and volumetric efficiency of 80 % per stage. Assume the polytropic index of compression in both the stags to be  $n = 1.25$  and neglect clearance. [10M]

OR

- 8 *A* On a particular day the weather forecast states that the dry bulb temperature is 37°C, while the relative humidity is 50% and the barometric pressure is 101.325 kPa. Find the humidity ratio, dew point temperature and enthalpy of moist air on this day. [10M]
- B* Explain the terms i) specific humidity ii) degree of saturation. [4M]

**SECTION-V**

- 9 *A* In the Otto cycle, the combustion process is treated as constant volume heat energy addition process. Explain why? [7M]
- B* An engine working on the Otto cycle is supplied with air at 0.1 MPa, 35°C . The compression ratio is 8. Heat supplied is 2100 kJ/kg. Calculate the maximum pressure and temperature of the Cycle, the cycle efficiency, and the mean effective pressure. (For air,  $C_p = 1.005$ ,  $C_v = 0.718$ , and  $R = 0.287$  kJ/kg K). [7M]

OR

- 10 *A* An air standard dual cycle has a compression ratio of 16, and compression begins at 1 bar, 50°C. The maximum pressure is 70 bar. The heat transferred to air at constant pressure is equal to that at constant volume. Estimate (a) the pressures and temperatures at the cardinal points of the cycle, (b) the cycle efficiency, and (c) the m.e.p. of the cycle,  $C_v = 0.718$  kJ/kg K,  $C_p = 1.005$  kJ/kg K. [7M]
- B* Define mean effective pressure and thermal efficiency of an air standard cycle. [7M]

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Code No: R20A0305

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

R20

(Autonomous Institution – UGC, Govt. of India)

II B.Tech I Semester Supplementary Examinations, June/July 2024

Fluid Mechanics & Hydraulic Machinery

(ME)

Roll No									
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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 Define the terms: [7M]  
Density, specific volume, specific gravity and vacuum pressure
- B An oil of viscosity 5 poise is used for lubrication between a shaft and sleeve. [7M]  
The diameter of the shaft is 0.5 m and it rotates at 200 r.p.m. Calculate the power lost in oil for a sleeve length of 100mm. The thickness of oil film is 1.0mm.

OR

- 2 A What is the difference between U-tube differential Manometers and inverted [7M]  
U-tube differential Manometers? Where are they used?
- B A U-tube differential manometer connects two pressure pipes A and B. Pipe [7M]  
A contains carbon tetrachloride having a specific gravity 1.594 under a pressure of 11.772 N/cm<sup>2</sup> and pipe B contains oil of Sp.gr. 0.8 under a pressure of 11.772 N/cm<sup>2</sup>. The pipe A lies 2.5m above pipe B. Find the difference of pressure measured by mercury as fluid filling U-tube.

**SECTION-II**

- 3 A Define and distinguish between: [7M]  
i) Uniform flow and non-uniform flow  
ii) Laminar and turbulent flow
- B In a steady flow, two points A and B are 0.5m apart on a straight stream line. [7M]  
If the velocity of flow varies linearly between A and B, what is the acceleration at each point, if the velocity at A is 3m/sec and velocity at B is 8m/sec

OR

- 4 A Derive Bernoulli's equation through Euler's equation of motion [7M]
- B The water is flowing through a pipe having diameter 20cm and 10cm at [7M]  
section 1 and 2 respectively. The rate of flow through pipe is 3.5 lit/sec. This section 1 is 6m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24N/cm<sup>2</sup>, find the intensity of pressure at section 2.

**SECTION-III**

- 5 A Discuss the concept of the boundary layer with reference to fluid motion over [7M]  
a flat
- B Discuss the phenomenon of separation for flow over curved surfaces [7M]

OR



- 6 A What do you understand by total energy line, hydraulic line, pipes in parallel, pipes in series and equivalent pipe? Explain [7M]  
B What will be the loss of head when pipes are connected in series? [7M]

**SECTION-IV**

- 7 A What type of turbine is kaplan turbine? Explain how it works with a neat diagram. Discuss the importance of draft tube in reaction turbines. [7M]  
B A jet of water diameter 50mm strike on a fixed plate in a such way that the angle between the plate and the jet is  $30^{\circ}$ . The force exerted in the direction of the jet is 1471.5N Determine the rate of flow of water. [7M]

OR

- 8 A Explain the term cavitation. Why does cavitation occur and what are its effects? [7M]  
B A Pelton wheel working under a head of 52 meters develops a shaft power of 92Kw at a speed of 250rpm. If the overall efficiency is 82.5% and  $C_v=0.98$ , find the jet diameter, the diameter of the bucket circle, the size of the buckets and the number of buckets required. Assume maximum efficiency condition that the peripheral velocity is 0.47 times the velocity of the jet. [7M]

**SECTION-V**

- 9 A Explain the principle and working of a Reciprocating pump with a neat sketch. [7M]  
B Water is to be pumped out of a deep well under a total head of 95m. A number of identical pumps of design speed 1000rpm. And specific speed 900rpm. With rated capacity of 150lit/sec are available. How many pumps will be needed and how should they be connected? [7M]

OR

- 10 A Draw and discuss the operating characteristics of a centrifugal pump [7M]  
B A multi stage centrifugal pump has impeller 375mm diameter and 18mm wide at outlet. The outlet vane angle is  $45^{\circ}$  and the vane occupy 8% of the outlet area. The manometric efficiency is 84% and the overall efficiency is 75% (i) What head the pump will generate when running at 900rpm, discharging 60liters/sec. (ii) What is the input power? [7M]

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**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY**

(Autonomous Institution – UGC, Govt. of India)

**II B.Tech I Semester Supplementary Examinations, June/July 2024****Metallurgy & Material Science**

(ME)

<b>Roll No</b>									
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**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 Differentiate between inter metallic compound and Electron compound [7M]  
 B Explain the types of bonds in solids with neat sketch [7M]

OR

- 2 A Classify various solid solutions present and explain in detail [7M]  
 B Explain different types of defects in crystalline structure [7M]

**SECTION-II**

- 3 A Draw the Fe-Fe<sub>3</sub>C diagram and label all the points, lines, temperatures and reactions [7M]  
 B i )what is the significance of lever rule [4+3M]  
 ii )Define allotropy and give examples

OR

- 4 A Apply the lever rule to phase equilibrium in an alloy 15% B and 85% A [7M]  
 when a liquid of 45% B is in equilibrium with a solid solution of 95%A  
 B With the help of a suitable example, explain the isomorphs alloy system. [7M]

**SECTION-III**

- 5 A Explain the structure and properties of malleable cast iron [7M]  
 B Discuss the classification of cast iron in detail [7M]

OR

- 6 A What are the properties and applications of aluminium alloys? [7M]  
 B Explain the composition, properties and applications of brass and bronze [7M]

**SECTION-IV**

- 7 A What is annealing? Explain different types of annealing processes [7M]  
 B What are the different methods of surface hardening? Explain any one in detail [7M]

OR

- 8 A Explain the construction of T-T-T diagram from solidification curve [7M]  
 B What are cermets? Discus about their usage [7M]

**SECTION-V**

- 9 A Explain metal-ceramic composites. Write a note on their properties give example [7M]  
 B Discuss about metal-matrix composites [7M]

OR

- 10 A Explain with neat sketch of open Hearth process and give its advantages [7M]  
 B Explain about Bessemer converter process [7M]

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