Z-4032/4039-7000

Printed Pages : 4 **TME – 101 / TME-201**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 4032/4039 Roll No.

B. Tech. (Sem. I & II)

SPECIAL CARRYOVER EXAMINATION, 2006-07

MECHANICAL ENGINEERING

*Time : **3** Hours]* *[Total Marks : **100***

Notes : *(1) Attempt **all** questions.*
*(2) Use of stream tables and metter **chart** is permitted.*
*(3) All questions carry **equal** marks.*

1 Attempt any **four** parts : **5×4=20**

(a) Define thermodynamic system, surrounding and universe.

(b) (i) Define 'Thermodynamics'.
(ii) Explain 'Thermodynamic equilibrium'.

(c) Differentiate between absolute pressure, gauge pressure and atmospheric pressure. Also give the value of atmospheric pressure in bar.

(d) Explain the Zeroth law of thermodynamics.

(e) A cyclic heat engine operates between a source temperature of 900°C and sink temperature of 30°C. What is the least rate of heat rejection per kW not output of the engine.

2 Answer any **two** of the following : **10×2**

(a) The following data is given for a Nozzle, determine the velocity at the exit of Nozzle and mass flow rate if specific volume of steam = $0.185 m^3/kg$ and inlet area = $0.1 m^2$, $h_1 = 3000$ kJ/kg, $V_1 = 60$ m/s, $h_2 = 2762$ kJ/kg $z_1 = z_2$, $Q = 0$.

(b) (i) What do you mean by quality of steam ?

(ii) Differentiate between wet steam and super heated steam.

(ii) Draw the Rankine cycle.

(c) Describe the working of a four-strobe S.I. engine with neat sketches.

3 Answer any **two** of the following : **10×2**

(a) (i) ABCD is a regular Hexagon. Forces 90 N, P, Q, 240 N and 180 N act along AB, CA, AD, AE and FA respectively. Find the forces P and Q for the condition of equilibrium of the system.

(ii) State Lam's theorem.

(b) The beam AB of span 12 m shown in fig is hinged at A and is on rollers at B. Determine the reactions at A and B for the loading shown.

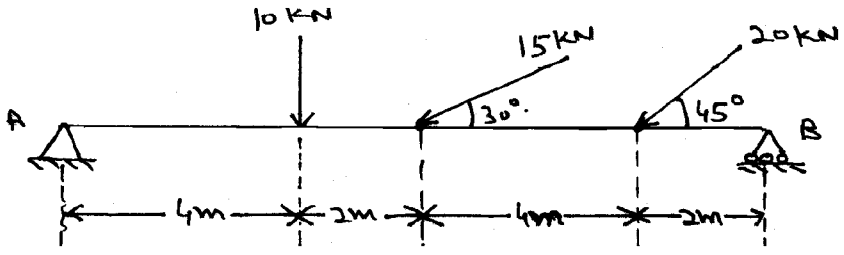

Fig. 1

(c) A weight 500 N just moving down a rough inclined plane supported by a force of 200 N acting parallel to the plane and it is at the point of moving up the plane when pulled by a force of 300 N parallel to the plane. find the inclination of the plane and the coefficient of friction between the machined plane and the weight.

4 Answer any **two** of the following : **10×2**

(a) Draw S.F. and B.M. diagram for the following overhanging beam.

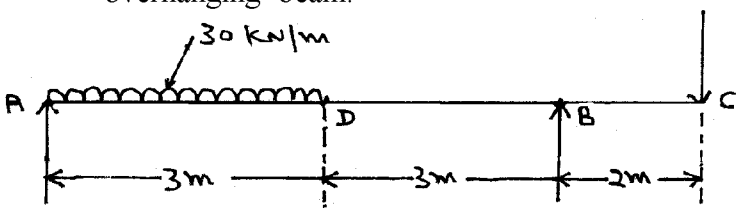

Fig. 2

(b) (i) What are the different types of trusses ? What are the methods used in the analysis of the trusses ?

(ii) Classify the trusses and explain.

(c) Draw stress-strain diagrams for ductile materials and describe their salient feature.

5 Answer any **two** of the following : **10×2**

(a) A tension test bar of circular C.S. tapers uniformly from 20 mm to 16 mm in a length of 200 mm. When an axial load of 80 kN is applied the extension measured over its length was 0.32 mm. Find the modulus of elasticity of material. If the Poisson's ratio of this material is 1/3, find the value of modulus of rigidity and bulk modulus.

(b) Stating the assumptions in the theory of simple Bending, derive bending equation

$$\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$$

Where M is bending moment, I = Moment of inertia, σ = Stress, Y = distance of fibre from N.A., E = Modulus of elasticity, R = Radius of Neutral surface after bending.

(c) Stating the assumptions, derive torsion equations :

$$\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{l}$$

Where T = Twisting moment, J = Polar moment of Inertia, τ = Shear stress at radius R, R = Radius of shaft, G = Modulus of rigidity, θ = Angle of twist, l = length of shaft.
