Printed Pages : 8

NME102/NME202

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

PAPER ID : 199229

Roll No.

B. Tech.

(SEM. II) THEORY EXAMINATION, 2014-15

ENGINEERING MECHANICS

Time : 3 Hours] [Total Marks : 100

Note : Assume suitable data if necessary.

PART-A (Compulsory)

1 Attempt all questions : 10×2=20

(a) How do you find the resultant of non coplaner concurrent force system ?

(b) "Friction is both desirable and undesirable". Explain.

(c) With neat sketches describe in brief different types of beams.

(d) What assumptions are made while determining stresses in a truss ?

(e) What is the difference between centroid and center of gravity ?

(f) State and explain perpendicular axis theorem.

(g) The equation of motion for motion of a particle is given by $S = 18t + 3t^2 - 2t^3$. Find acceleration and velocity at $t = 2$ sec.

(h) State and explain D'Alembert's Principles.

(i) Draw stress strain diagram for mild steel indicating salient points.

(j) How is shear stress developed due to torsion ? Explain.

PART-B

2 Attempt any three parts of the following : **10×3=30**

(a) Derive the expression of mass moment of inertia for a circular disc about its diametral axis.

(b) A uniform ladder, 5m long weighs 180 N. It is placed against a wall making an angle of 60° with floor. The coefficient of friction between the wall and ladder is 0.25 and between the floor and the ladder is 0.35. The ladder has to support a mass 900 N at its top. Calculate the horizontal force 'p' to be applied to the ladder at the floor level to prevent slipping.

(c) A steel beam of hollow square section having outer side of 60 m and inner side of 50 mm is simply supported on a span of 4 m. Find the maximum point load that the beam can carry at the middle of the span if the bending stress is not to exceed 120 N/mm^2.

(d) Determine the reaction at support A and D in the structure shown in fig. 1

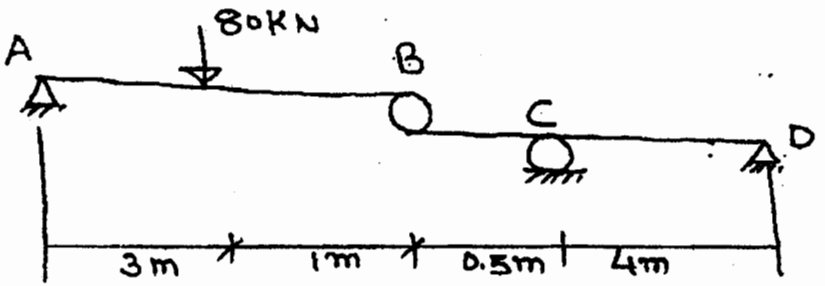

fig. 1

(e) A cylinder of weight 1000 N and radius 40 cm is in equilibrium as shown in fig 2. Find the tension in the rope AC. Length of BC is 2 mtr.

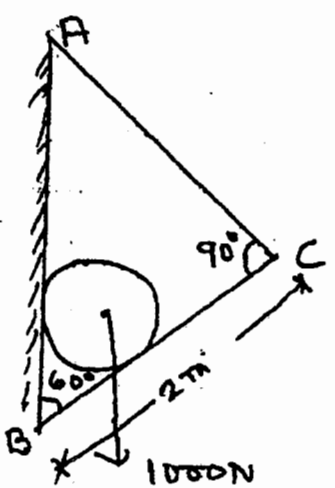

Fig. 2

PART-C

3 Attempt any one part of the following : 10×1=10

(a) A system of weight connected by string passing over pulleys A and B shown in fig 3. Find the acceleration of three weights. Assuming string is weightless and ideal condition for pulleys.

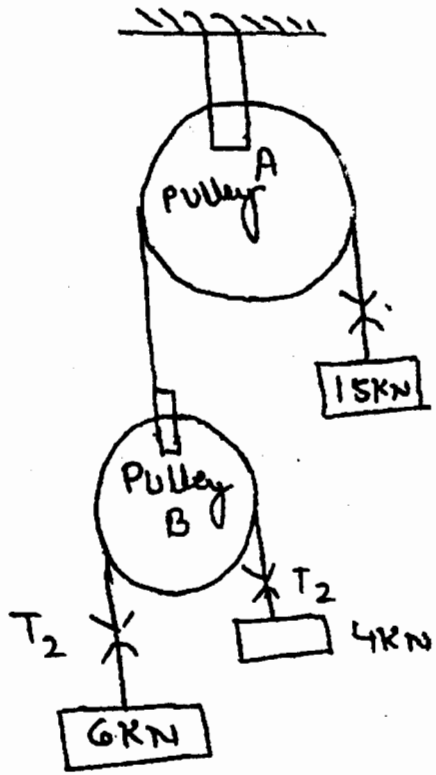

Fig. 3

(b) Determine the force P required to impend the motion of the block B Shpwn in Fig. 4 Take coefficient of friction = 0.3 for all contact surface.

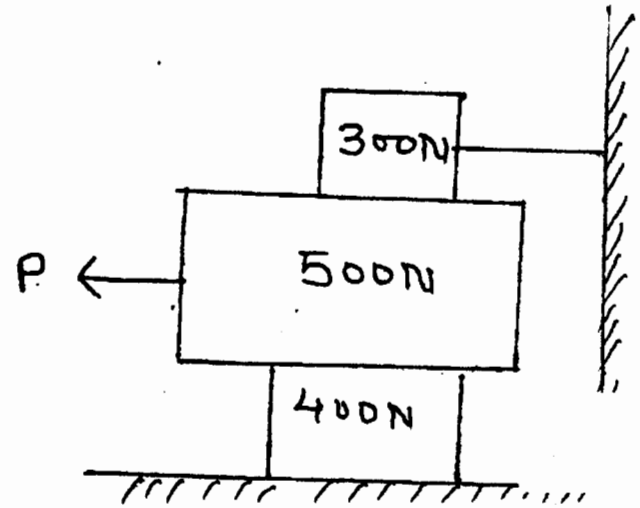

Fig. 4

4 Attempt any one part of the following : 10×1=10

(a) Determine SFD and BMD for the simply supported beam as shown in fig 5 and also find maximum B.M.

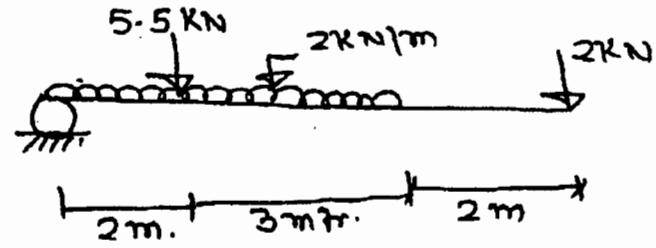

Fig. 5

(b) Determine the forces in all members of the truss as shown in fig. 6

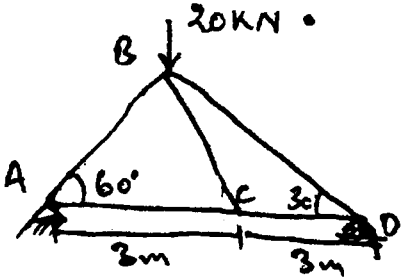

Fig. 6

5 Attempt any one part of the following : **10×1=10**

(a) Show that the product of inertia of an area about two mutually perpendicular axis is zero if the area is symmetrical about one of these axis.

(b) Locate the centroid of the shaded area shown in fig. 7 All dimensions are in meters.

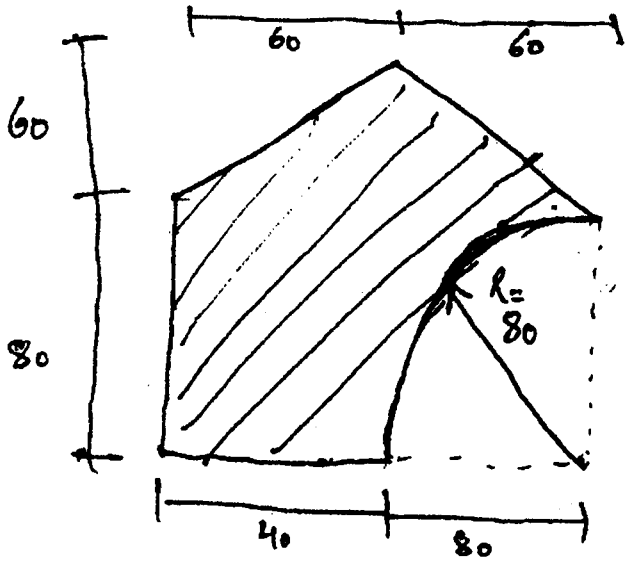

Fig. 7

6 Attempt any one part of the following : **10×1=10**

(a) (i) A stone is dropped into a well and is heard to strike the water after 4 seconds. Find the depth of the well if the velocity of sound is 350 m/s.

(ii) Discuss and describe the laws of motion applied to planar translation and rotation.

(b) Write short notes on :

(i) Principle of work and energy

(ii) Law of conservation of energy

(iii) Law of conservation of linear momentum

(iv) Plane motion of rigid bodies.

7 Attempt any one part of the following : 10×1=10

(a) (i) Discuss the principle of Superposition for elongation.

(ii) A steel Bar 2m long, 20 mm wide, 10 mm thick is subjected to a pull of 20 kN in the direction of length. Find the changes in length, breadth, thickness of bar. Take $E = 2\times10^5$ N/mm^2 and Poisson's ratio 0.3.

(b) A torque of 1 kN-m is applied to a 40 mm diameter rod of 3 mtr. length. Determine the maximum shearing stress induced and twist produced. Take G = 80 GPa.
