Printed Pages : 2 Roll No. EME202

B.TECH.
THEORY EXAMINATION (SEM–II) 2016-17
ENGINEERING MECHANICS

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer. In case of numerical problem assume data wherever not provided.*

SECTION – A

1. Explain the following: **10 x 2 = 20**

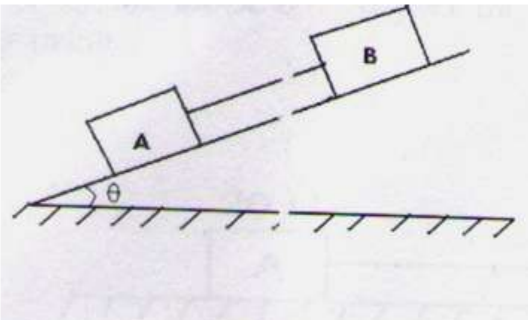
(a) Explain coplanar concurrent forces.
(b) Explain Polygon law of forces.
(c) Explain coulomb's law of friction.
(d) State and explain parallel axis theorem.
(e) Give the methods used to analyze the truss.
(f) Differentiate between perfect, imperfect and redundant truss.
(g) Where does the position of centre of gravity of cone and hemisphere lie?
(h) What is the difference between ductile and brittle material.
(i) Define coefficient of friction.
(j) Differentiate between shear force and bending moment.

SECTION – B

2. Attempt any five of the following questions: **5 x 10 = 50**

(a) The sum of two concurrent forces P and Q is 500N and their resultant is 400N. If the resultant is perpendicular to 'P', find P, Q and angle between P and Q.

(b) Two blocks A & B weighing 250N and 400N respectively are resting on an inclined plane. They are connected by a string as shown in F**ig. 1.** The coefficient of friction under the blocks and plane are $\mu_A = 0.25$ and $\mu_B = 0.5$,
(i) What should be the angle of θ the plane at which the sliding of the blocks will impend?
(ii) What will be the tension in the string?



(Fig. 1)

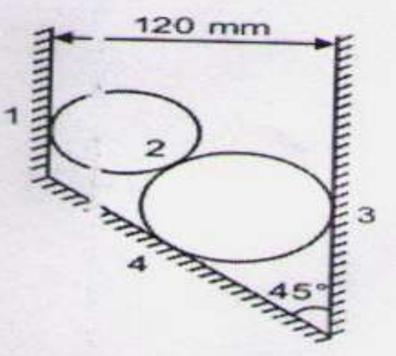


Fig2

(c) Two cylinders of diameters 100 mm and 50 mm, weighing 200 N and 50N, respectively are placed in a trough as shown in **Fig. 2.** Neglecting friction, find the reactions at contact surfaces 1, 2, 3 and 4.

(d) Determine mass moment of inertia of the cone of radius 'r' and mass 'm' about its centroidal axis.

(e) A ball is dropped from the top of a tower 30m high. At the same instant a second ball is thrown upward from the ground with an initial velocity of 15m/sec. When and where do they cross and with what relative velocity?

(f) Derive the bending equation: $\frac{M}{I} = \frac{E}{R} = \frac{\sigma}{y}$

(g) The composite bar shown in Fig 3 is subjected to a tensile force of 30 kN and the diameter of brass bar is 20mm, diameter of steel bar is 25mm. The extension observed is 0.44mm. Find the Young's modulus of brass, if Young's modulus of steel is $2X10^5$ N/mm^2.

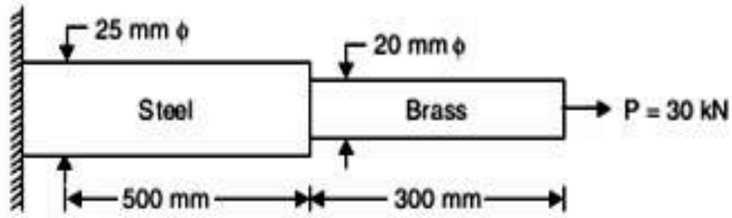


Fig 3

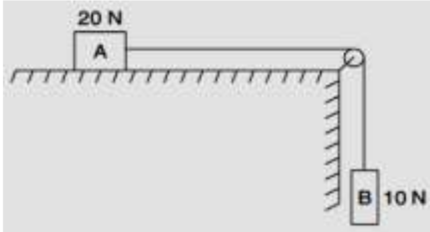


Fig 4

(h) Two blocks shown in Fig-4 have weight A=20 N and B=10N and the coefficient of friction between the block A and the horizontal plane is 0.25. If the system is released from rest, and the B falls through a vertical distance 2m, what is the velocity attained by the block B. Neglect the friction in the pulley and the extension of the string

SECTION – C

Attempt any two of the following questions: **2 x 15 = 30**

3 Draw the SFD and BMD of the overhanging beam loaded as shown in Fig-5

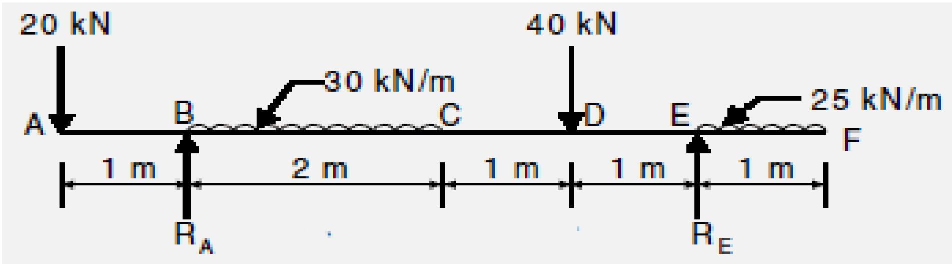


Fig 5

4 A ladder of length L rests against a wall, the angle of inclination being 45°. If the coefficient of friction between the ladder and the ground and that between ground and the wall is 0.5 each, what will be the maximum distance on ladder to which a man whose weight is 1.5 times the weight of ladder may ascend before the ladder begins to slip?

5 The cross-section of a plain concrete culvert is as shown in Fig. 7. Determine the moment of inertia of the shaded area about the horizontal centroidal axes. All the dimensions are in mm.

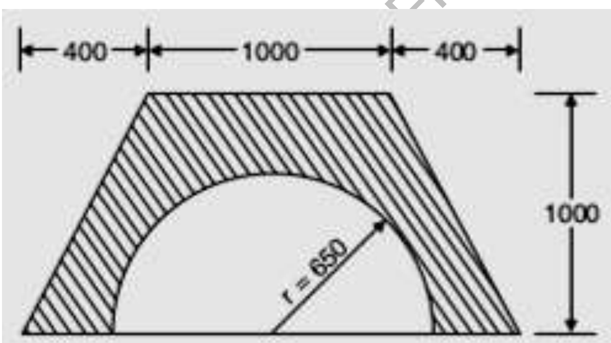


Fig 7