Code: 13A01101 R13

B.Tech I Year (R13) Regular Examinations June/July 2014

ENGINEERING MECHANICS

(Common to CE, ME, AE, MCTE & Ch.E)

Time: 3 hours Max. Marks: 70

Part – A
(Compulsory Question)
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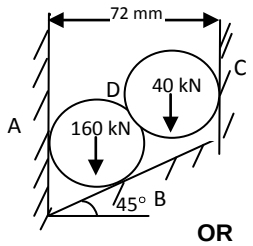
1 Answer the following: (10 x 02 = 20 Marks)

(a) What are the different types of supports?
(b) What is free vector? Give example of free vector.
(c) Explain the term cone of friction.
(d) State the laws of static and dynamic friction.
(e) Define centre of gravity and centroid.
(f) Define the terms 'moment of inertia' and 'radius of gyration'
(g) Define the terms 'velocity' and 'acceleration'.
(h) Distinguish between uniform motion and uniformly accelerated motion.
(i) Sketch any two types of roof trusses.
(j) Explain the terms 'amplitude' and 'frequency'

Part – B
(Answer all five units, 05 X 10 = 50 Marks)

Unit - I

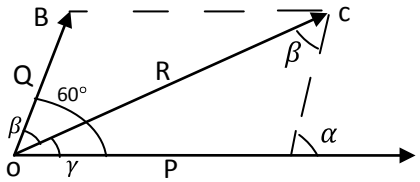
2 Two cylinders of diameters 60 mm and 30 mm weighing 160 N and 40 N respectively are placed as shown in figure below. Assuming all the contact surfaces to be smooth, find the reactions at A, B and C.



OR

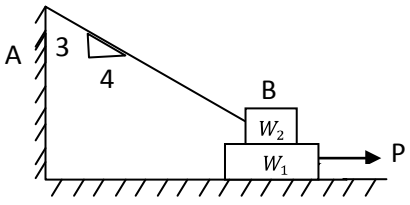
3 (a) A simply supported beam of 3 m span carries two loads of 5 kN each at 1 m and 2 m from the left hand support. Find the reactions at both the ends.

(b) Two forces P and Q are acting at a point O as shown in figure below. The resultant force is 400 N and angle β and γ are 35° and 25° respectively. Find the two forces P and Q.



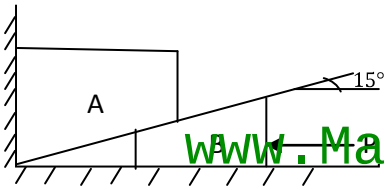
Unit - II

4 A block of weight W_1 = 1,290 N rests on a horizontal surface and supports another block of weight W_2 = 570 kN on top of it as shown in figure below. Block of weight W_2 is attached to a vertical wall by an inclined string AB. Find force 'P' applied to the lower block, that will be necessary to cause the slipping to impend. Coefficient of friction between blocks (1) and (2) = 0.25 and coefficient of friction between (1) and horizontal surface = 0.40.



OR

5 Determine the horizontal force 'P' required for wedge 'B' to raise the block 'A' of weight 4500 kN, if the coefficient of friction on all surfaces is 0.20 as shown in the figure given below.



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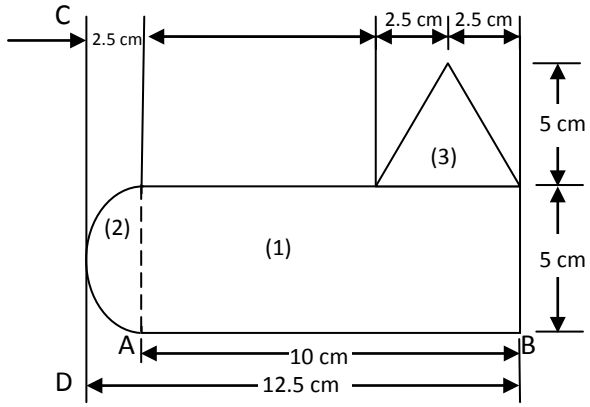
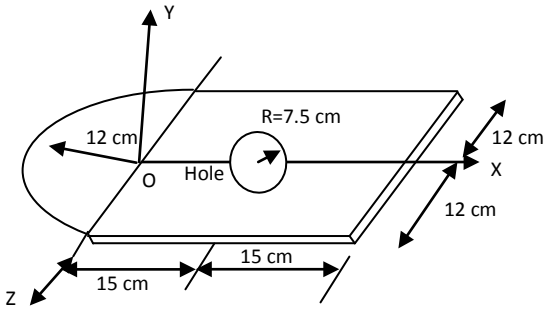
Unit - III

6 Determine the centre of gravity of plane uniform lamina as shown in figure given below.



OR

7 A thin plate of 6 mm thickness is cut and machine component is made from the plate as shown in figure given below. Assuming the density of steel as 7850 kg/m^3, calculate the mass moment of inertia about z-axis as shown in figure given below.



Unit - IV

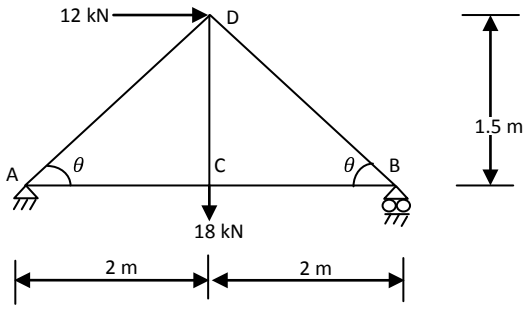
8 A particle moves along a straight line so that its displacement in metre from a fixed point is given by $x = t^3 + 3.0\ t^2 + 4.0\ t + 5$, where 'x' is in meters and 't' in seconds. Find.
(i) Velocity at start and after 4 seconds.
(ii) Acceleration at start and after 4 seconds.

OR

9 A 50 N block is released from rest on an inclined plane which makes an angle 35° to the horizontal. The block starts 'A' slides down a distance of 1.2 m and strikes a spring with a stiffness of 8 kN/m. The coefficient of friction between the inclined plane and block is 0.25. Determine: (i) The amount the spring gets compressed and (ii) Distance the block will rebound up the plane from the compressed position.

Unit - V

10 Determine the forces in the members of the truss shown in figure given below, which carries a horizontal load of 12 kN and vertical load of 18 kN.



OR

11 A particle is moving with simple harmonic motion and performs eight complete oscillations per minute. If the particle is 50 mm from the centre of the oscillation, determine the amplitude, the velocity of the particle and maximum acceleration. Given that the velocity of the particle at a distance of 70 mm from centre of oscillation is 0.6 times the maximum velocity.

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