Code No: 131AE

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B .Tech I Year I Semester Examinations, December - 2018
ENGINEERING MECHANICS
(Common to CE, EEE, ME, ECE, CSE, EIE, IT, MCT, ETM, MMT, AE, MIE, PTM, CEE, MSNT)

Time: 3 hours   **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

1.a)	What is triangle law of force?	[2]
b)	State and explain Lami's theorem.	[3]
c)	What forces are involved in ladder wall application if the wall is rough.	[2]
d)	What are the laws of friction?	[3]
e)	What does the second theorem of pappus indicate?	[2]
f)	Define radius of gyration.	[3]
g)	What is the moment of inertia of a sphere?	[2]
h)	What is the mass moment of inertia of a hollow cylinder with outer radius, inner radius and length as R, r and L respectively?	[3]
i)	What is the principle of conservation of energy?	[2]
j)	Explain D Alemberts principle.	[3]

PART - B

(50 Marks)

2.a)   What is Newton's first law of motion and law of transmissibility of forces?
  b)   Find the magnitude and direction of the resultant force. Also find the position of the resultant force from point P of the bar PS (Figure 1).   [5+5]
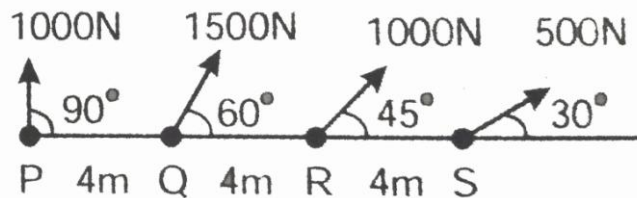
Figure: 1
OR

3. Determine x,y,z, components of 750 N and 900 N and also the angles θ_x, θ_y and θ_z that the force forms with coordinate axes shown in figure 2. [10]
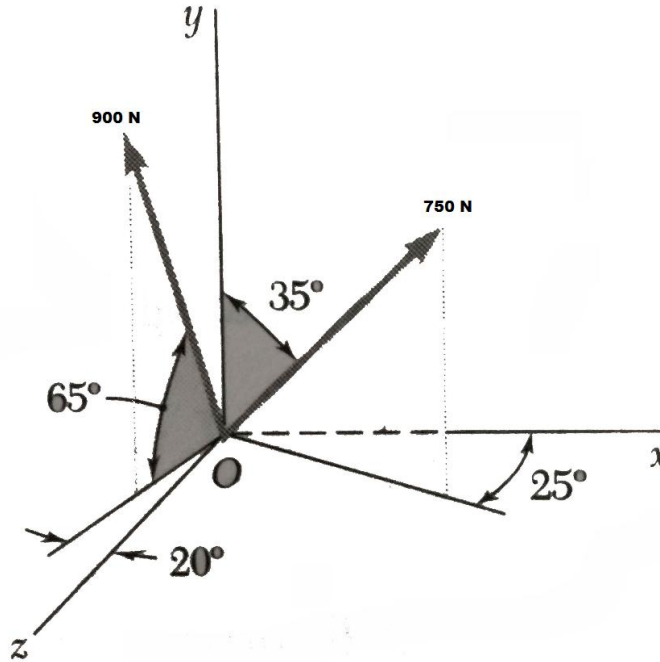

Figure: 2

4. What is the least value of P to cause motion of the system shown in figure 3 towards the right. Also find θ. Assume coefficient of friction to be 0.2. Body A and B weighs 900 N and 650 N respectively. [10]
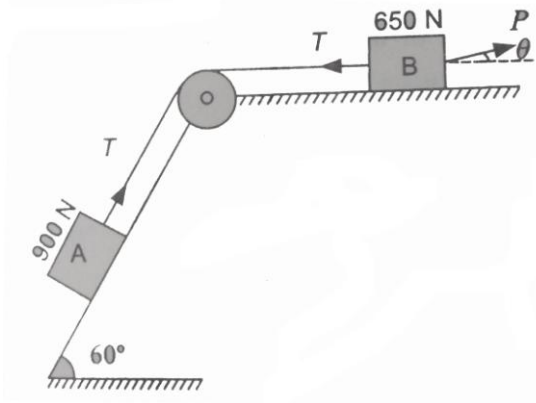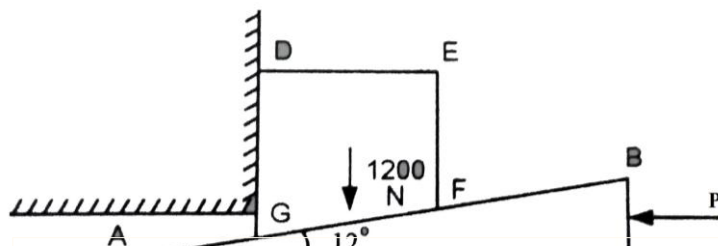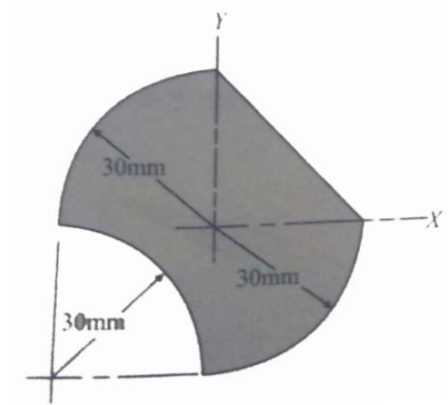

Figure: 3

OR

5. A 12⁰ wedge resting on a horizontal floor supports a block of weight 1200 N as shown in Figure 4. The block is to be raised by applying a horizontal force P to the wedge. Assume coefficient of friction between all contact surfaces to be 0.28. Determine minimum horizontal force applied to the wedge to raise the block. [10]
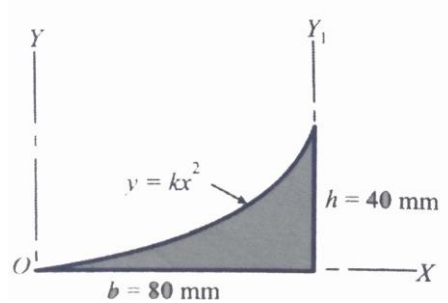
Figure: 4

6. Locate the centroid of the shaded area as shown in Figure 5. [10]

Figure: 5

OR

7. Find the moment of inertia about Y axis of the shaded area under the second degree curve as shown in Figure 6. [10]
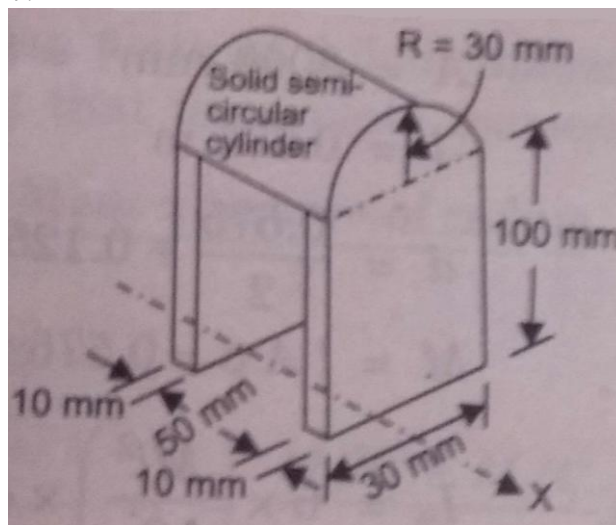

Figure: 6
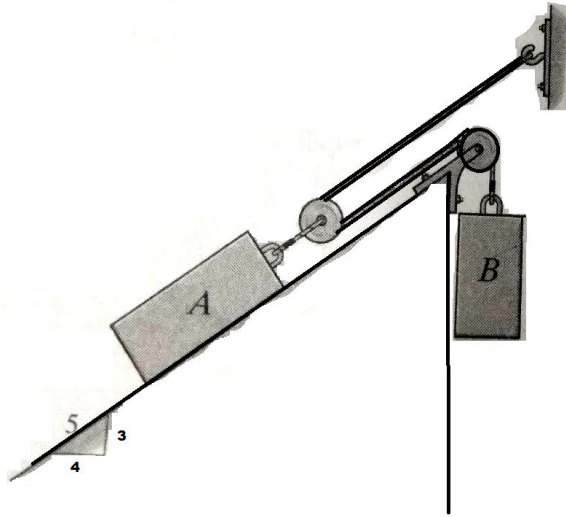
8. Derive the mass moment of inertia of a cone about its base having radius r and height h. [10]

OR

9. Determine the radius of gyration in m about the centroidal X axis of the casting as shown in figure 7. [10]
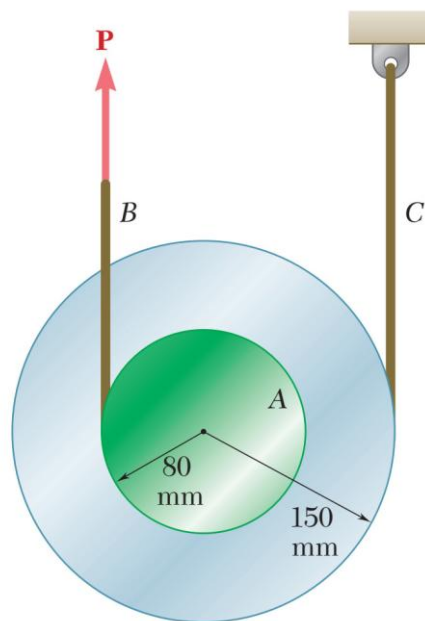

Figure: 7

10.   Block A has a weight of 300 N and block B has a weight of 50 N. Determine the speed of block A after it moves 2 m down the plane, starting from the rest (Figure 8).   [10]

Figure: 8

OR

11.a)   A train of weight 1800 kN ascends a slope of 1 in 100 with a uniform speed of 40 kmph. If the track resistance is 5 N per kN of superimposed load, find the power spent by the engine.

   b)   The double pulley shown in figure 9 has a mass of 3 kg and a radius of gyration of 100 mm. knowing that pulley is at rest, a force of 24 N is applied to cord B, determine the velocity of the centre of the pulley after 1.5 sec and tension in cord C.   [5+5]

Figure: 9

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