Code No: R201210

R20

SET - 1

I B. Tech II Semester Regular Examinations, September - 2021

ENGINEERING MECHANICS

(Com. to ME, PE, Agri E, FE)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

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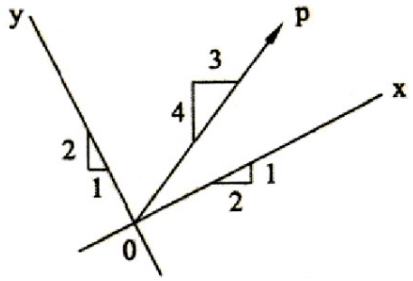
UNIT-I

1. a) What do you mean by limiting friction and impending motion? Explain? (5M)

   b) If the X component is as shown in figure of P is 893 N, determine P and its Y component. (9M)

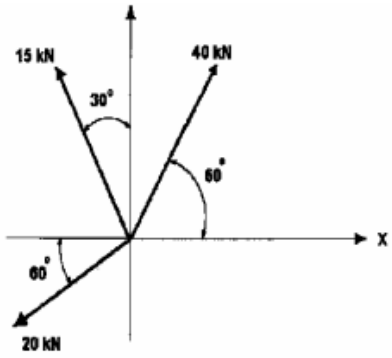


Figure

Or

2. a) Explain coulomb's laws of dry friction. (5M)

   b) Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point O as shown in figure. The angles made by 40 kN, 15 kN and 20 kN forces with X-axis are 60^0, 120^0 and 240^0 respectively. Determine the magnitude and direction of the resultant force. (9M)



Figure

UNIT-II

3. a) Three identical cylinders, each weighing W, are stacked as shown in figure, on smooth inclined surfaces, each inclined at an angle 'θ' with the horizontal. Determine the smallest angle 'θ' to prevent stack from collapsing. (7M)
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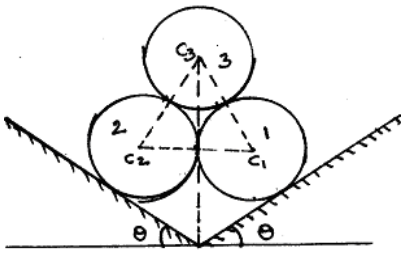
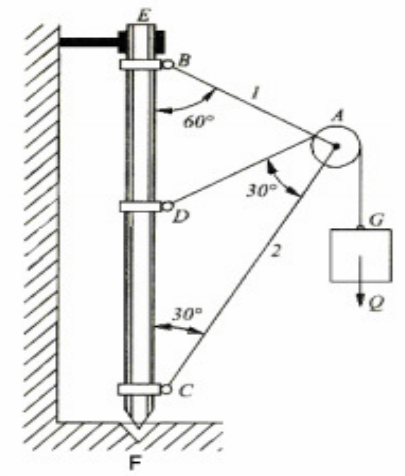


Figure

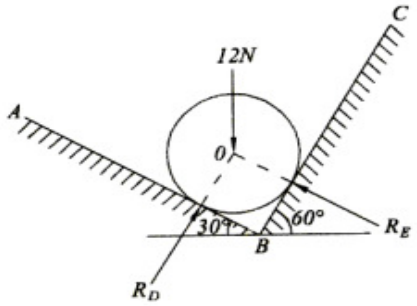
b) A pulley A is supported by two bars AB and AC which are hinged at points B and C to a vertical mast EF as shown in figure. Over the pulley hangs a flexible cable DG which is fastened to the mast at D and carries at the other end G a load Q = 20 kN. Neglecting friction in the pulley, determine the forces produced in the bars AB and AC. The angles between the various members are as shown in the figure. (7M)



Figure

Or

4. a) A ball of weight Q = 12 N rests in a right - angled trough, as shown in figure. Determine the forces exerted on the sides of the trough at D and E if all surfaces are perfectly smooth. (7M)

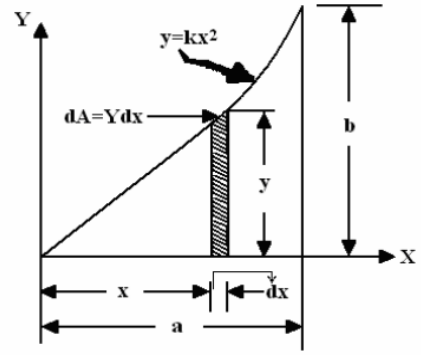


Figure

b) Explain the equations of equilibrium of coplanar systems and triangle law of forces. (7M)

UNIT-III

5. a) Determine the centroid of the parabolic spandrel as shown in figure. (8M)

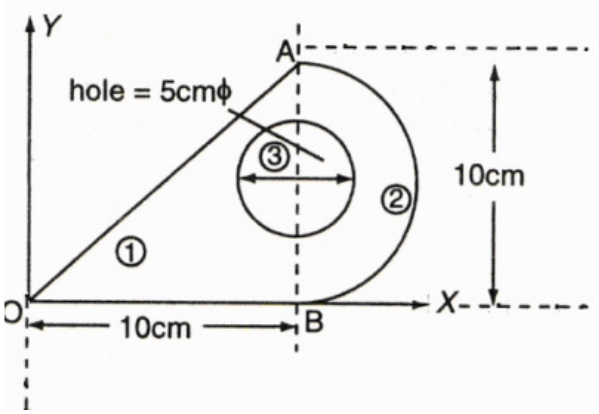


Figure

b) Derive the expression for mass moment of inertia of a cone of height 'h' and base radius 'r' and mass density 'w' with respect to its geometric axis. (6M)

Or

6. a) Find the moment of inertia of the area in the given figure about the axis 'AB' (10M)

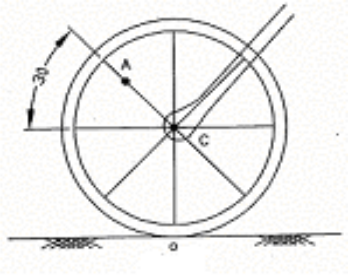


Figure

b) Distinguish between centroid and centre of gravity? (4M)

UNIT-IV

7. a) Cycle is travelling along a straight road with a velocity of 10m/s. Determine the velocity of point A on the front wheel as shown in figure. Radius of cycle wheel = 0.4m and distance of A from C=0.2m. (7M)

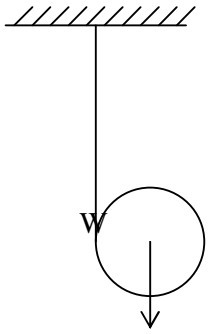


Figure

b) A train is traveling at a speed of 60km/hr. It has to slow down due to certain repair work on the track. Hence, it moves with a constant retardation of 1km/hr per second until its speed is reduced to 15km/hr. It then travels at a constant speed of for 0.25km/hr and accelerates at 0.5km/hr per second until its speed once more reaches 60km/hr. Find the delay caused. (7M)

Or

8. a) A right circular cylinder of radius 'r' and weight 'W' is suspended by a cord that is wound around its surface as sown in figure. If the cylinder is allowed to fall, prove that the centre of gravity 'C' will follow a vertical rectilinear path and find the acceleration 'a_c' along this path. Determine also the tensile force 'S' in the cord. (7M)

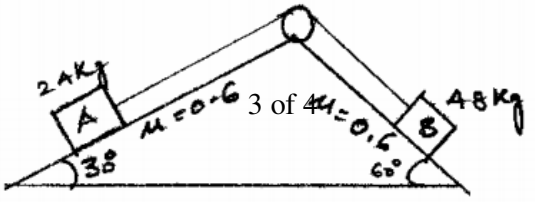


Figure

b) The motion of a particle in rectilinear motion is defined by the relation $s = 2t^3 - 9t^2 + 12t - 10$ where s is expressed in metres and t in seconds. Find i) the acceleration of the particle when the velocity is zero ii) the position and the total distance traveled when the acceleration is zero. (7M)

UNIT-V

9. By using impulse – momentum method, determine the velocity of blocks shown in figure, after 10 seconds if the blocks are starting from rest. (14M)



Figure

Or

10. a) An automobile moving with a uniform velocity of 40Kmph is accelerated by increasing the traction force by 20%. If the resistance to motion is constant, find the distance traveled before it acquires 50Kmph.Use work-energy method. (8M)

b) Illustrate impulse momentum method? (6M)