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Question Paper Code : X 20661

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Second Semester
Civil Engineering
GE 6253 – ENGINEERING MECHANICS
(Common to all branches)
(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions

PART – A

(10×2=20 Marks)

1. Write the equilibrium equation of a concurrent 2D force system.
2. State the law which defines inertia.
3. Distinguish between moment and couple.
4. Define free body diagram.
5. State the pappus-guldinus theorem – ii.
6. What is the relevance of centre of gravity with stability ?
7. Carom board, snooker games are employing which principle ?
8. In cricket, why the fielder brings his hands closer to his body while catching the ball ?
9. Define Rolling resistance, with respect to tires.
10. What is meant by general plane motion ?

PART – B

(5×16=80 Marks)

11. a) If two forces $F_1 = 20$ kN and $F_2 = 15$ kN act on a particle as shown in fig. 11(a), find their resultant direction by (i) Parallelogram law (ii) Triangle law.

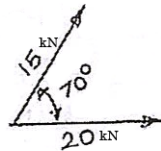
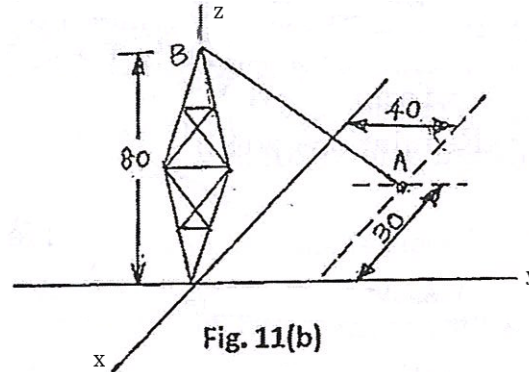


Fig.11(a)

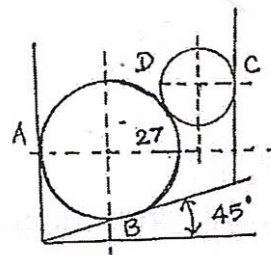
(OR)



- b) A tower guy wire is anchored by means of a bolt at A as shown in fig. 11(b). The tension in the wire is 2500N. Determine the components F_x , F_y and F_z of the force acting on the bolt and θ_x , θ_y , and θ_z .

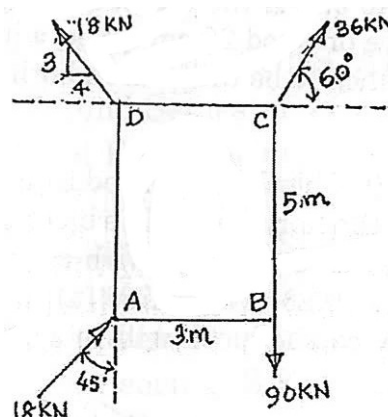


12. a) Two cylinders of diameters 60 mm and 30 mm weighing 160 N and 40 N respectively are placed as shown in fig 12(a). The horizontal distance between centres is 27 mm. Assuming all the contact surfaces are smooth, find reactions at A, B and C.



(OR)

- b) Determine the resultant of the co-planer non-concurrent force system shown in fig. 12(b). Calculate its magnitude, direction and locate its position with respect to the sides AB and AD.





13. a) Find the centroid of the lamina shown in fig. 13(a) about the base and the 250 mm edge.

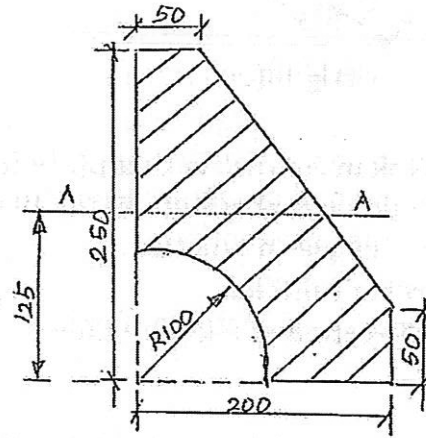


Fig.13(a)

(OR)

- b) Find the moment of inertia of the section shown in fig. 13(b) about centroidal axes.

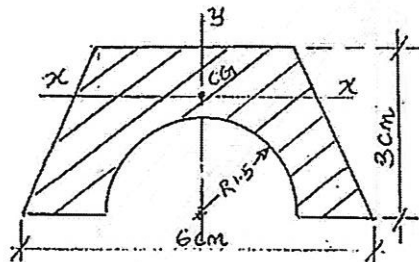


Fig.13.(b)

14. a) A bullet moving at a rate of 250 m/s, is fired into a log of wood. The bullet penetrates to a depth of 40 cm. If the bullet moving with the same velocity is fired into a similar piece of wood 20 cm thick, with what velocity would it emerge ? Take the resistance to be uniform in both the cases.

(OR)



- b) As shown in fig. 14(b), a 50 N block is released from rest on an inclined plane making an angle of 35° to the horizontal. The block starts from a slides down a distance of 1.2 m and strikes a spring with a stiffness of 8 kN/m. The μ between block and plane is 0.25. Determine (a) the amount the spring gets compressed and (b) distance the block will rebound up the plane from the compressed position.

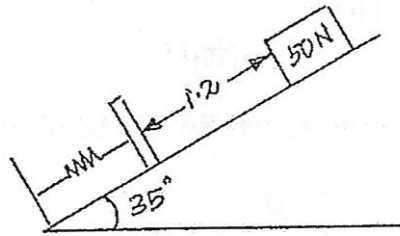


Fig.14(b)

15. a) A block of weight 1600 N is in contact with a plane incline 30° to horizontal. A force 'p' parallel to the plane and acting up the plane $\mu = 0.2$. Find.
- The value of 'P' to just cause the motion.
 - The value of 'P' to prevent motion.
 - The magnitude and direction of frictional force.

(OR)

- b) A ladder of weight 390 N and 6m long is placed against a wall at an angle of 30° as shown. The μ between the ladder and the wall is 0.25 and that between ladder and floor is 0.38. Find how high a man of weight 1170 N ascend, before the ladder begins to slip.

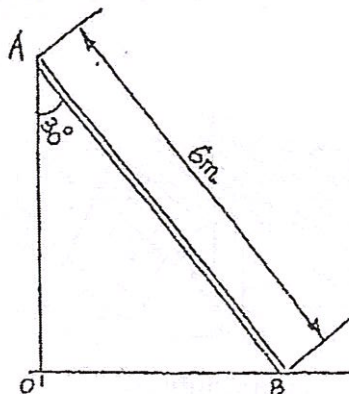


Fig. 15(b)