

R7

Code: R7100306

B.Tech I Year (R07) Supplementary Examinations, June 2013

CLASSICAL MECHANICS

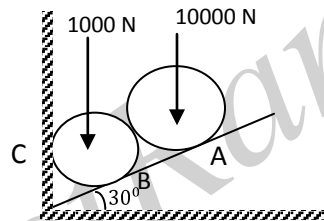
(Mechanical Engineering)

Time: 3 hours

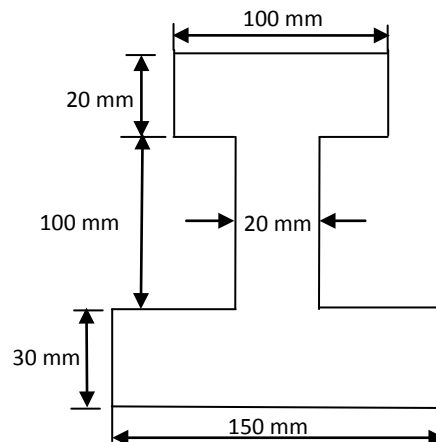
Max Marks: 80

Answer any FIVE questions
All questions carry equal marks

- 1 (a) Define and explain the following terms:
(i) Coplanar and non coplanar forces. (ii) Collinear and concurrent forces.
- (b) A particle is acted by three forces with magnitude 2 kN, $2\sqrt{2}$ kN and 1 kN. The first force is along the horizontal direction, second makes an angle of 45° with horizontal and third is along vertical direction. Determine the resultant of the given forces.
- 2 (a) Explain and define the term 'Free body diagram'. Draw the free body diagram of a ball of weight 'W' placed on a horizontal surface.
- (b) Two identical rollers each of weight $W = 1000$ N are supported by an inclined plane and vertical wall as shown in figure (a) find the reactions at the point of supports A, B and C. Assume all the surfaces to be smooth.



- 3 (a) Determine the centroid of a triangle of base 'b' and height 'h'.
- (b) Locate the centroid of the I-section shown in figure.

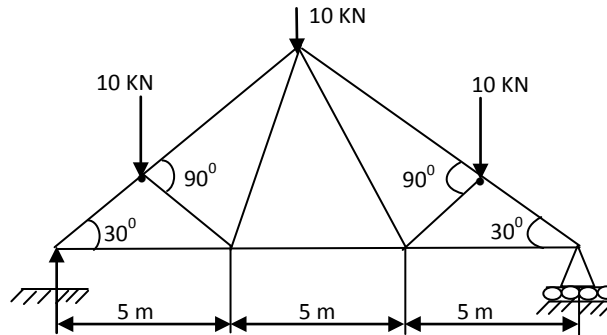


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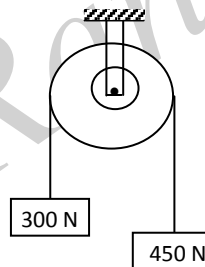
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- 4 (a) Prove the parallel axis theorem in the determination of moment of inertia of area with the help of a neat sketch.
 (b) Determine the moment of inertia of the solid sphere of radius 'R' about its diameter axis.
- 5 Find out the stresses in all the members of the truss as shown in figure.



- 6 (a) A burglar's car had a start with an accelerator of 2 m/sec^2 . A police vigilant party came after 5 seconds and continued to chase the burglar's car with a uniform velocity of 20 m/sec . Find the time taken in which the police van will overtake the burglar's car.
 (b) Two bodies weighing 300 N and 450 N are hanged to the ends of a rope pressing over an ideal pulley as shown in figure. With what accelerator the heavier body comes down. What is the tension in the string?



- 7 (a) State the work energy principle. Derive the work energy equation for translation.
 (b) A block weighing 2500 N rests on a level plane for which coefficient of friction is 0.20 . This block is pulled by a force of 1000 N acting at an angle of 30° to the horizontal. Find the velocity of the block after it moves 30 m starting from rest. If the force of 1000 N is then removed, how much further will it move? Use work energy method.
- 8 A vertical shaft 100 mm in diameter and 1 m length has its upper end fixed to the ceiling. At the other end it carries a disc of weight 5000 N having a radius of gyration of 450 mm . The modulus of rigidity for the material of the shaft is $0.8 \times 10^5 \text{ N/mm}^2$. Determine the frequency of torsional vibrations and transverse vibrations if $E = 2 \times 10^5 \text{ N/mm}^2$.
