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Question Paper Code : 53128

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to All Branches)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Lami's theorem.

2. Define the principle of transmissibility of force.

3. Distinguish between the resultant and equilibrant.

4. Find R_A and R_B of the beam shown in Fig. 4.

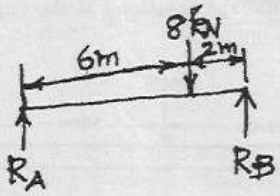

Fig. 4

5. Differentiate between center of gravity and centroid.

6. State parallel axis theorem as applied to area Moment of Inertia.

7. A particle is projected into space at an angle of 30° to the horizontal at a velocity of 40 m/s. Find the maximum height reached by the projectile.

8. Distinguish between perfectly plastic impact and perfectly elastic impact.

9. A small ball is dropped from a height of 19.62 m. At what velocity the ball will strike the ground.

10. Define instantaneous centre of rotation.

PART B — (5 × 16 = 80 marks)

11. (a) Two cylinders E, F of diameter 60 mm and 30 mm. weighing 160 N and 40 N respectively are placed as shown in Fig. 11(a). Assuming all the contact surfaces to be smooth, find the reactions at A, B and C.

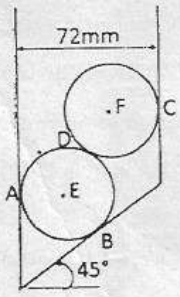

Fig. 11(a)

Or

(b) Forces 32 kN, 24 kN, 24 kN and 120 kN are concurrent at origin and are respectively directed through the points whose coordinates are A(2, 1, 6). B(4, –2, 5), C(–3, –2, 1) and D(5, 1, –2). Determine resultant of the system.

12. (a) Frame supported at A and B is subjected to a force of 500 N as shown in Fig. 12(a). Compute the reactions at the support points for the cases of $\theta = 0^\circ, \theta = 60^\circ, \theta = 90^\circ$. (16)

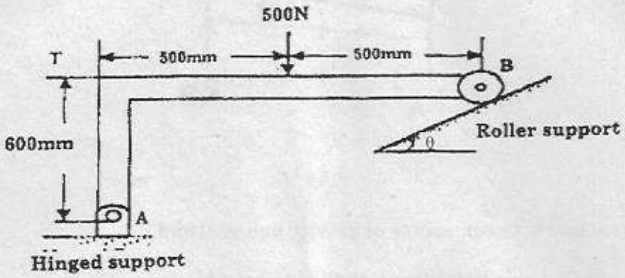

Fig. 12(a)

Or

(b) Find the support reactions of the beam loaded as shown in Fig. 12 (b). (16)

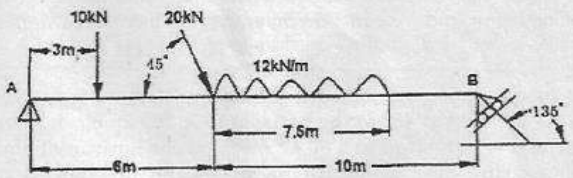

Fig. 12(b)

13. (a) A cone of base diameter 200 mm is fitted to a hemisphere of diameter 200 mm centrally. What should be the height of cone so that the centroid of the solid combination lies at the junction between the cone and hemisphere?

Or

(b) Find the moment of inertia of the section shown in Fig. 13(b) about the x and y centroidal axes. All dimensions are in min.

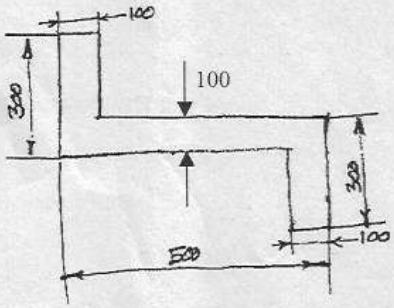

Fig. 13(b)

14. (a) A bullet of mass 20 grams is fired horizontally with a velocity of 300 m/s, from a gun carried in a carriage; which together with the gun has a mass of 100 kg. The resistance to sliding of the carriage over the ice on which it rests is 20 N. Find

(i) Velocity, with which the gun recoils

(ii) Distance, in which it comes to rest

(iii) Time taken to come to rest. (16)

Or

(b) A mass 10 kg travelling towards right with a speed of 25 m/s collides with another mass 20 kg travelling in the same direction with a speed of 9 m/s. If the coefficient of restitution is 0.6, find the velocities of masses after collision and loss in kinetic energy. What is the impulse on either mass? (16)

15. (a) Two rough planes are joined together one of them is horizontal and the other is inclined at 45° to the horizontal. A 100 kg block is on the inclined plane and is connected to a 60 kg block on the horizontal plane through a cable passing over a smooth pulley at the junction of the planes A dragging force of A is applied on 60 kg block at an angle of θ to the horizontal. Find the magnitude of the force and the value of θ for the motion about to start. Assume $\mu = 0.25$. (16)

Or

(b) A homogeneous sphere of mass m_1 and radius r_1 and a homogeneous cylinder of mass m_2 and radius r_2 roll along an incline without slipping. They start from rest at the top and reach the bottom at different times which of the two reaches the bottom earlier? Justify. (16)
