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B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Second Semester

(Regulation 2004)

Civil Engineering

(Common to all branches of BE/B.Tech)

(Common to BE Part-Time First Semester, Regulation –2005)

GE 1151 — ENGINEERING MECHANICS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the triangular law of forces.

2. State the principle of transmissibility.

3. What is the general condition of equillibrium of a rigid body?

4. What is the moment of a force about an axis?

5. Define first moment of an area about an axis.

6. Express radius of gyration of a body in terms of its mass moment of inertia.

7. State D'Alembert's principle.

8. Define coefficient of restitution.

9. What is limiting friction?

10. Give two examples of general plane motion.

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PART B — (5 × 16 = 80 marks)

11. (a) The magnitude of the resultant of two con-current forces including an angle of 90° between them is $\sqrt{13}$ kN. When the included angle between the forces is 60°, the magnitude of their resultant is $\sqrt{19}$ kN. Find the magnitudes of the two forces. (16)

Or

(b) Three links PQ, QR, and RS connected as shown in Fig. 1 below, support loads W and 50 N. Find the weight W and the force in each link if the system remains equillibrium.

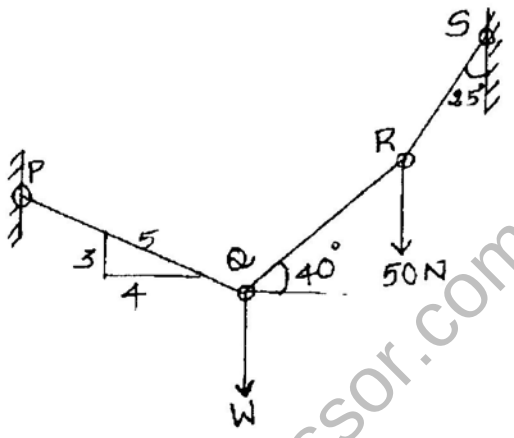

Fig. 1

12. (a) Two identical spheres each of weight 2 kN and radius 20 cm are kept in a horizontal channel of width 70 cm as shown in Fig. 2 below-Determine the reactions at the points of contact P, Q and R. (16)

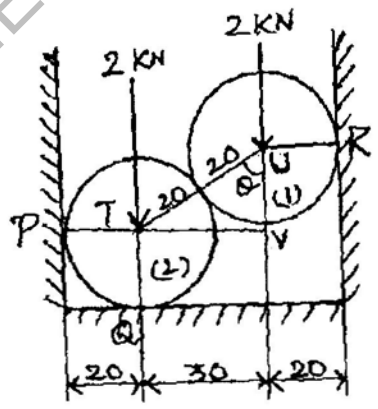

Fig. 2

Or

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(b) Determine the horizontal and vertical components of reactions for the beam loaded as shown in Fig. 3 below. Neglect the weight of the beam. (16)

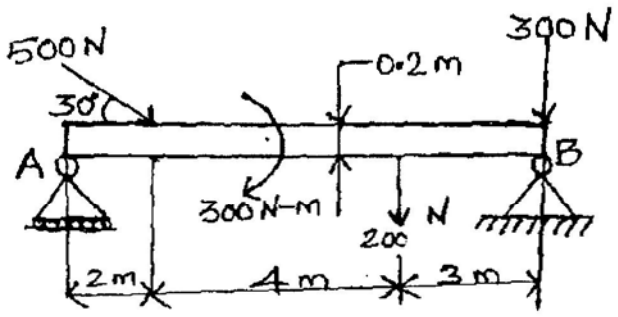

Fig. 3

13. (a) A solid cone of base diameter 80 mm and height 50 mm rests centrally over a solid cylinder of diameter 80 mm and height 100 mm. Find the position of the centroid of the composite solid combination. (16)

Or

(b) Find the moment of inertia of T-section about X-X passing through its centroid as shown in Fig. 4. All the dimensions are in mm.

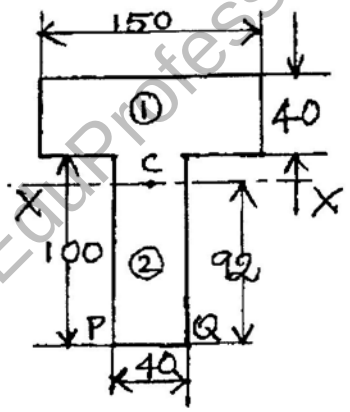

Fig. 4

14. (a) (i) A car covers a distance of 30 m in 3 seconds and 70 m in 5 seconds. Find the initial velocity of the car and the acceleration assuming it to be uniform. (8)

(ii) A ball is projected vertically upwards with a velocity of 20 m/s. Two seconds later, a second ball is projected vertically upwards with a velocity of 16 m/s. Find the height above the surface at which the two balls meet. (8)

Or

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(b) A horizontal force of 18 N moves a body of mass 4 kg which is initially at rest on a table. Find (i) the work done by the applied force in 8 seconds (ii) work done by the friction in 8 seconds (iii) work done by the net force on the body in 8 seconds and (iv) change in kinetic energy of the body in 8 seconds. Take coefficient of kinetic friction as 0.2. (16)

15. (a) A block weighing 200 N rests on a plane inclined at 45° to the horizontal. The block is tied by a horizontal string as shown in Fig. 5. The block is in equilibrium when the tension in the string is 70 N. Determine the friction force, the normal reaction of the plane and the coefficient of friction between the block and the plane. (16)

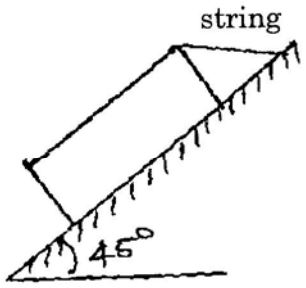

Fig. 5

Or

(b) A block of mass 50 kg starts sliding from rest on a 40° inclined plane as shown in Fig. 6. What is the velocity of the block if the distance moved by the block down the incline is 2.5 m? Also find the time taken by the block to cover the said distance. Take the coefficient of kinetic friction between the block and the plane as 0.2. (16)

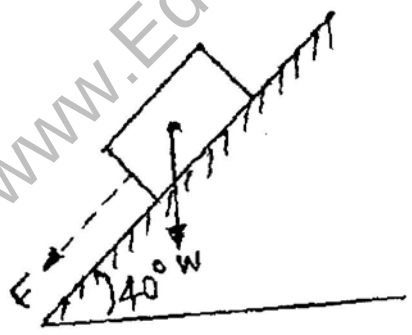

Fig. 6

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