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Question Paper Code : 57023

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to all branches except Computer Science and Engineering, Information Technology, Computer and Communication Engineering, Electronics and Communication Engineering, Biomedical Engineering, Medical Electronics Engineering, Electrical and Electronics Engineering, Electronics and Instrumentation Engineering and Instrumentation and Control Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Resolve the 100 N force acting 30° to horizontal into two component one along horizontal and other along 120° to horizontal.
2. Two forces of 400 N and -600 N act at an angle 60° to each other. Determine the resultant in magnitude and direction.
3. Replace the force 600 N from A as shown Fig.1 by equivalent force and couple at B.

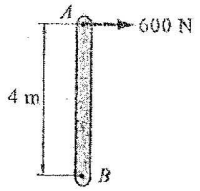

Fig.1

4. Find the resultant of the force systems shown in Fig. 2.

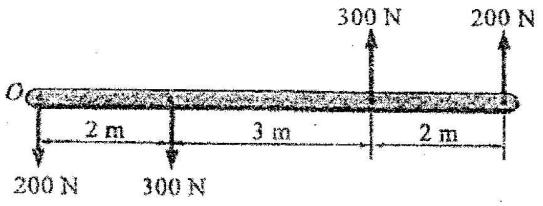

Fig.2

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5. Define centroid.

6. Define Polar moment of inertia.

7. A motorist is travelling at 90 kmph, when he observes a traffic light 250 m ahead of him turns red. The traffic light is timed to stay red for 12 sec. If the motorist wishes to pass the light without stopping, just as it turns green, determine

   (a) the required uniform deceleration of the motor and

   (b) the speed of the motor as it passes the traffic light.

8. Define Work Energy Principle.

9. Define angle of friction.

10. What is general plane motion?

PART B — (5 × 16 = 80 marks)

11. (a) Two cylinders, having weight W_A = 2000 N and W_B = 1000 N are resting on smooth inclined planes having inclination 60° and 45° with the horizontal respectively as shown in Fig.3. They are connected by a weightless bar AB with hinge connections. The bar AB makes 15° angle with the horizontal. Find the magnitude of the force P required to hold the system in equilibrium.

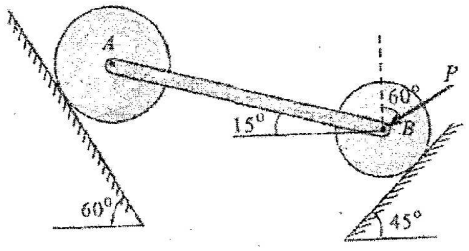

Fig.3

Or

(b) Block P = 5 kg and block Q of mass m kg is suspended through the chord is in the equilibrium position as shown in Fig.4. Determine the mass of block Q.

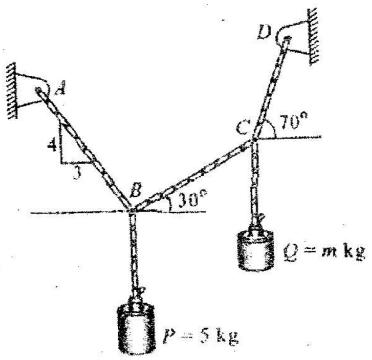

Fig.4

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12. (a) Determine the tension in cable BC as shown in Fig. 5. Neglect the self-weight of AB.

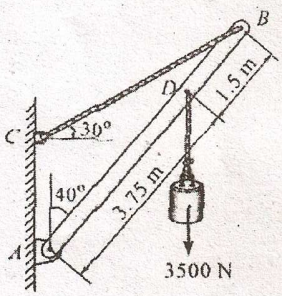

Fig.5

Or

(b) Find the resultant of the force system shown in Fig.6. Radius =2.5 m.

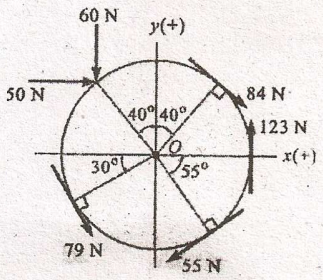

Fig.6

13. (a) Find the centroid of the shaded area OPQ, shown in Fig.7. The curve OQ is parabolic.

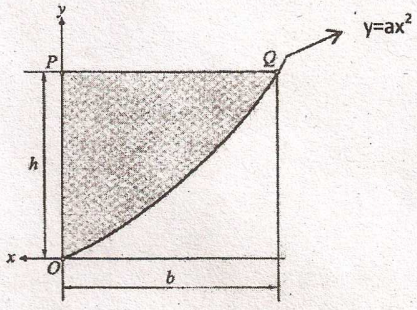

Fig.7

Or

(b) Find the moment of inertia of shaded area shown in Fig. 8 about $I_{x\text{-}x}$ axis and $I_{y\text{-}y}$ axis.

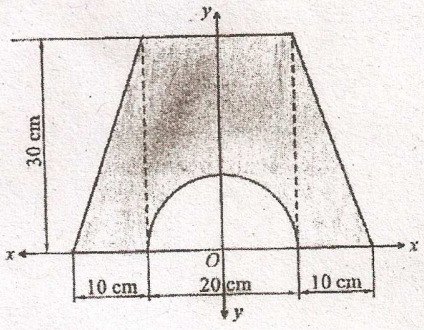

Fig.8

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14. (a) A body A is projected vertically upwards from the top of a tower with a velocity of 40 m/s, the tower being 180 m high. After t sec, another body B is allowed to fall from the same point. Both the bodies reach the ground simultaneously. Calculate t and the velocities of A and B on reaching the ground.

Or

(b) Two smooth spheres 1 and 2 having a mass of 2 kg and 4 kg respectively collide with initial velocities as shown in Fig. 9. If the coefficient of restitution for the spheres is e = 0.8, determine the velocities of each sphere after collision.

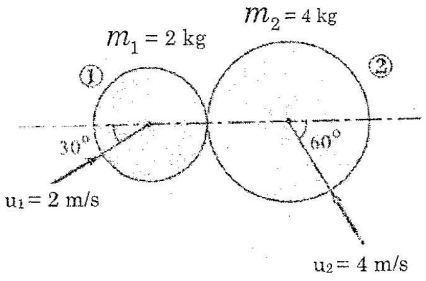

Fig.9

15. (a) Two blocks A and B are placed on inclined planes as shown in Fig. 10. The block A weighs 1000 N. Determine minimum weight of the block B for maintaining the equilibrium of the system. Assume that the blocks are connected by an inextensible string passing over a frictionless pulley. Coefficient of friction μ_A between the block A and the plane is 0.25. Assume the same value for μ_B.

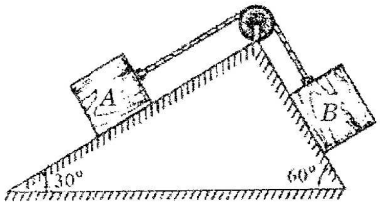

Fig.10

Or

(b) Two bodies of 9 kg and 13.5 kg are suspended on two ends of a string passing over a pulley of radius 275 mm and moment of inertia = 16.5 kgm^2 as shown in Fig. 11. Determine the tensions in the strings and the angular acceleration of the pulley.

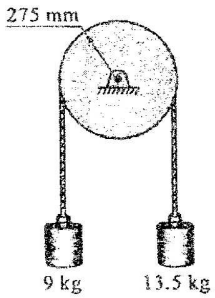

Fig.11

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