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Question Paper Code : 27275

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

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

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Polygon law of forces.

2. State the equations of equilibrium of a coplanar system of forces.

3. Give the different types of support in beams.

4. Define principle of transmissibility.

5. State the theorems of Pappus and Guldinus to find out the surface area and volume of a body.

6. Write the expression for centroid of hemisphere and circular lamina.

7. What is the frictional force generated when a body of mass 10kg resting on a horizontal plane subjected to a horizontal force p in earth gravitational field, if the coefficient of friction is 0.25.

8. A body of weight 150N rest on a horizontal plane. If a horizontal force of 50N can just move it, then what will be the value of coefficient of friction.

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) A system of four forces acting on a body is as shown in Fig. 11 (a). Determine the resultant forces and its direction. (16)

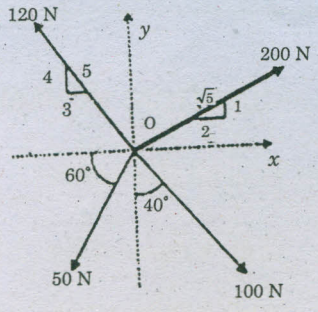

Fig. 11 (a)

Or

(b) Determine the tension in the cables AB and AC required to hold the 40kg crate as shown in Fig. 11 (b) (16)

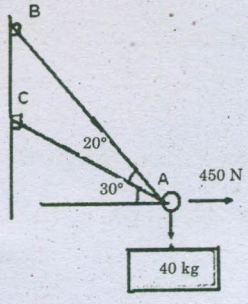

Fig. 11 (b)

12. (a) 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)

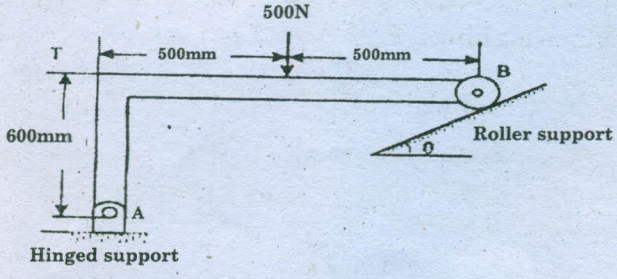

Fig. 12 (a)

Or

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

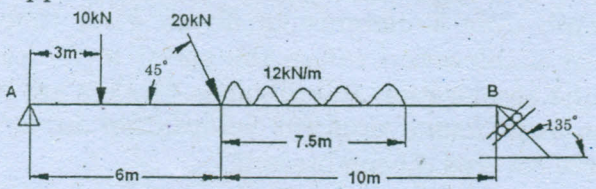

Fig. 12 (b)

13. (a) For the plane area shown in Fig. 13(a), locate the centroid of the area. (16)

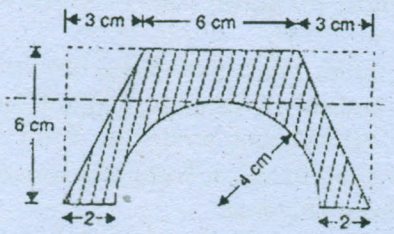

Fig. 13(a)

Or

(b) Find the Moment of Inertia of the section shown in Fig. 13(b) about horizontal and vertical axes through the centroid. Also determine the principle moment of inertia. (16)

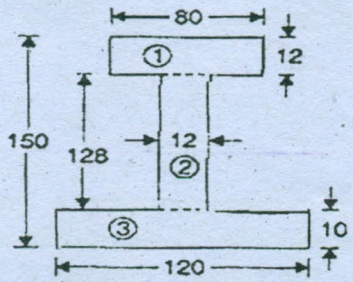

Fig. 13(b)

14. (a) (i) Define angle of friction and angle of repose. (4)

(ii) A ladder is 8 m long and weighs 300. The centre of gravity of the ladder is 3m along the length of ladder from the bottom end. The ladder rests against a vertical wall at B and on the horizontal floor at A as shown in Fig. 14 (a). Determine the safe height up to which a man weighing 900N can climb without making the ladder slip. The co-efficient of friction between ladder and floor is 0.4 and ladder top and wall is 0.3. (12)

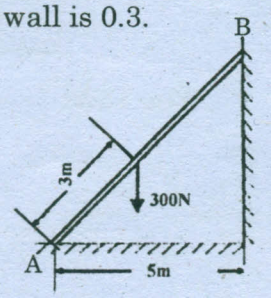

Fig. 14 (a)

Or

(b) (i) A car starts from rest and accelerates uniformly to a speed of 80 kmph over a distance of 500m. Find time and acceleration. Further acceleration raises the speed to 96 kmph in 10 seconds. Find the acceleration and distance. Brakes are applied to bring the car to rest under uniform retardation in 5 seconds. Find the distance covered during braking. (8)

(ii) A projectile is thrown with a velocity of 5 m/s at elevation of 60° to the horizontal. Find the velocity of another projectile thrown at an elevation of 45° which will have (1) equal horizontal range (2) equal maximum height (3) equal time of flight with the first. (8)

15. (a) The two blocks of mass 20kg and 40kg are connected by a rope passing over a friction less pulley as shown in Fig. 15(a). Assuming co-efficient of friction as 0.3 for all contact surfaces. Find the tension in the string, acceleration of the system. Also compute the velocity of the system after 4 second starting from the rest. (16)

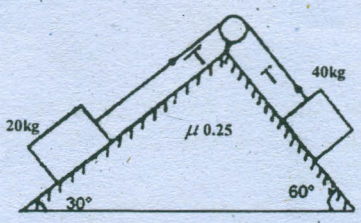

Fig. 15(a)

Or

(b) An inextensible string passing over a smooth pulley as shown in Fig. 15(b) joining two blocks. If the blocks are released simultaneously from rest, determine the velocity of block A after it has moved over 2 m and the tension in the string. Assume the co-efficient of friction at the contact surface is 0.2 . Use energy principle. (16)

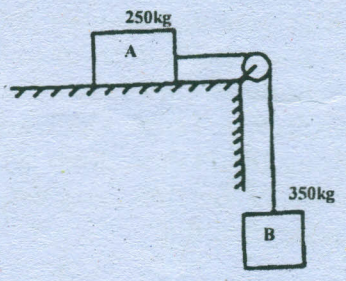

Fig. 15(b)