Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 80506

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to Mechanical Engineering (Sandwich) Aeronautical Engineering, Agriculture Engineering, Automobile Engineering, Civil Engineering, Environmental Engineering, Geoinformatics Engineering, Industrial Engineering, Manufacturing Engineering, Industrial Engineering and Management, Marine Engineering, Materials Science and Engineering, Mechanical Engineering, Mechanical and Automation Engineering, Mechatronics Engineering, Petrochemical Engineering, Production Engineering, Robotics and Automation Engineering, Chemical Engineering, Chemical and Electro Chemical Engineering, Fashion Technology, Food Technology, Handloom Technology, Petrochemical Technology, Petroleum Engineering, Pharmaceutical Technology, Plastic Technology, Polymer Technology, Textile Chemistry, Textile Technology, Textile Technology (Fashion Technology)

(Regulations 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. Differentiate between couple and moment.
4. Write the equations of equilibrium of a rigid body in two dimensions.
5. Define 'centroid of a plane area'.
6. What do you understand by mass moment of inertia?
7. Define linear momentum and angular momentum.
8. Give the equation of work energy for a rectilinear motion.
9. Distinguish between dry and fluid friction.
10. What is general plane motion?

PART B — (5 × 16 = 80 marks)

11. (a) A horizontal line PQRS is 12 m long, where PQ = QR = RS = 4m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R, S respectively in downward direction. The line of action of these forces makes angle of 90°, 60°, 45° and 30° respectively with PS. Find the magnitude, direction and position of resultant force. (16)

Or

(b) A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig. 11.b. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W_1 and W_2. (16)

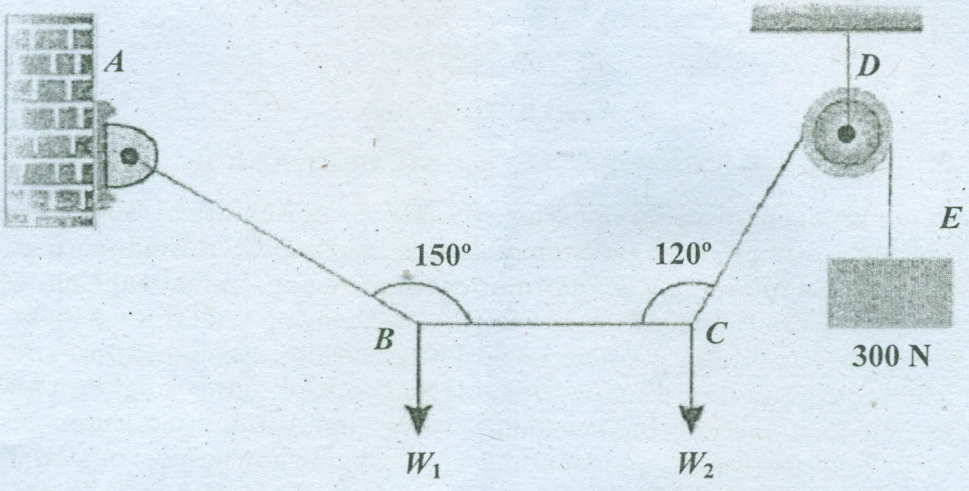

Fig. 11.b

12. (a) A fixed crane (Fig. 12.a) has a mass of 1000 kg and it is used to lift a 2400 kg weight. It is held in place by a pin at A and a rocker at B. The centre of gravity of the crane is located at G. Determine the components of reaction at A and B. (16)

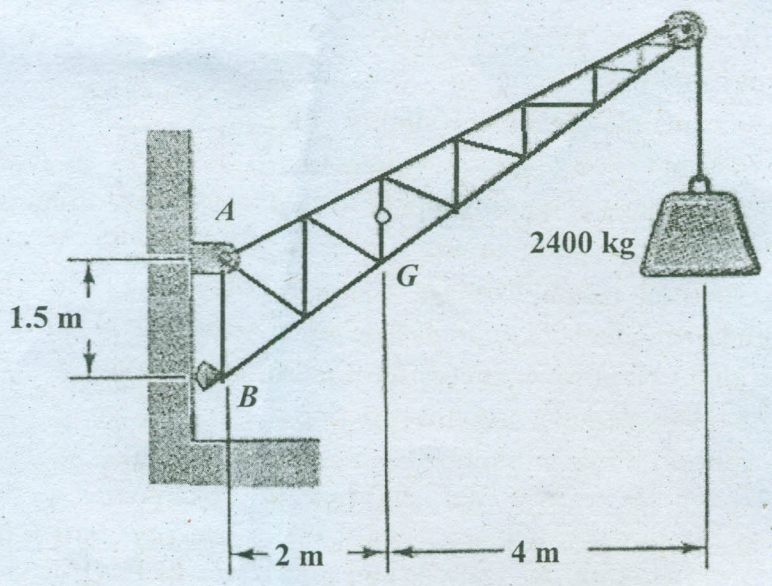

Fig. 12.a

Or

(b) The frame (Fig. 12.b) supports the part of the roof of a small building. The tension in the cable is 150 kN. Determine the reaction at the fixed end E. (16)

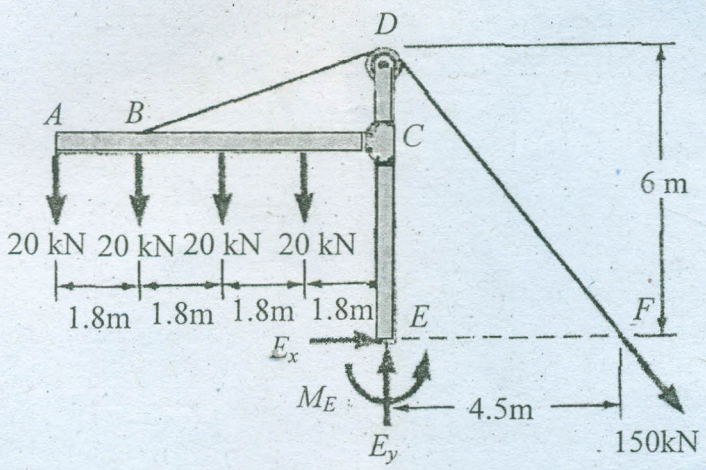

Fig.12.b

13. (a) A uniform lamina shown in Fig. 13.a. consists of a rectangle, a semi-circle and a triangle. Determine the centroid of the lamina. (16)

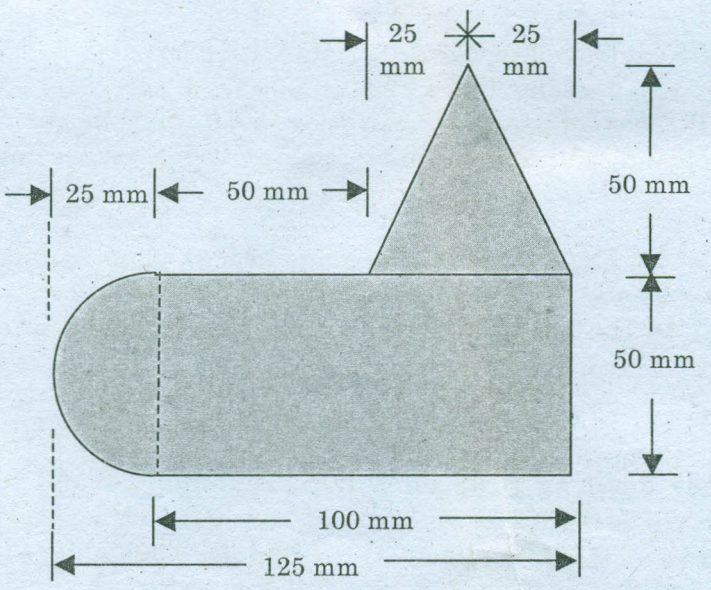

Fig.13.a

Or

(b) Find the area moment of inertia of the T section, shown in Fig. 13.b. (16)

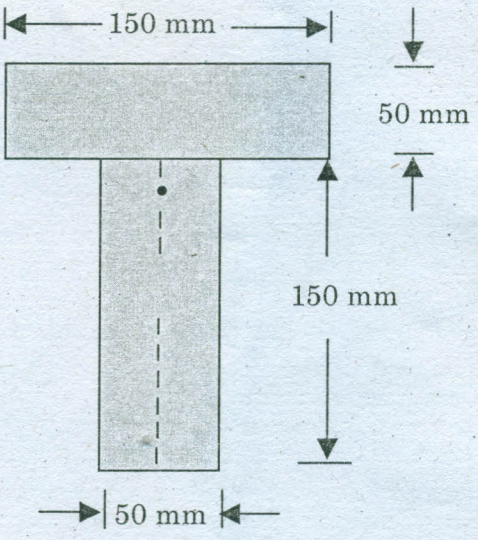

Fig. 13.b

14. (a) A bullet of mass 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 10kg 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 co-efficient 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) A load of 1.5 kN, resting on an inclined rough plane, can be moved up the plane by a force of 2 kN applied horizontally or by a force 1.25 kN applied parallel to the plan. Find the inclination of plane and coefficient of friction. (16)

Or

(b) A ladder 5m long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at the middle. The ladder is at the point of sliding, when a man is weighing 750 N stands on a rung 1.5 m from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. (16)