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

Question Paper Code : 80179

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

Second/Third Semester

GE 8292 — ENGINEERING MECHANICS

(Common to : Aeronautical Engineering/Aerospace Engineering/ Agriculture Engineering/Automobile Engineering/Civil Engineering/ Environmental Engineering/ Industrial Engineering/ Industrial Engineering and Management/Manufacturing Engineering/ Marine Engineering/Material Science and Engineering/Mechanical Engineering/ Mechanical Engineering (Sandwich)/Mechanical and Automation Engineering/ Mechatronics Engineering/Petrochemical Engineering/Production Engineering/ Robotics and Automation Engineering/Petrochemical Technology/ Petroleum Engineering)

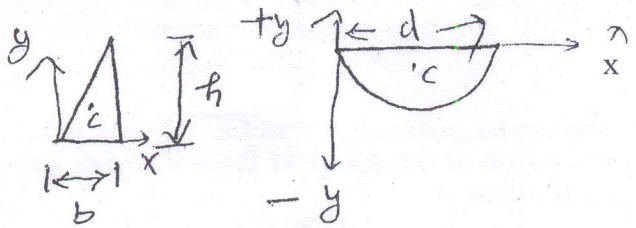
(Regulation 2017)

Time : Three hours — Maximum : 100 marks

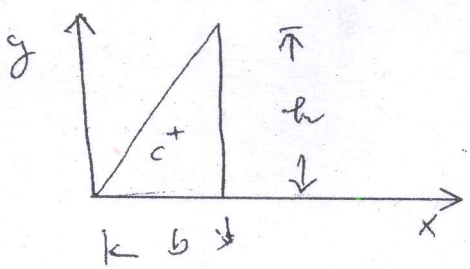
Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State the principle of transmissibility with an example.
2. Give two practical applications, from where the concept of cross product evolved.
3. Hinged support has two reactions —Justify.
4. Find the moment of a force $\overline{F} = (200i + 100j)N$ acting at a point 'A' $(2i + 3j)m$ from the origin.
5. Locate the centroid of the given shapes.



6. Using parallel axis theorem find the area moment of inertia of a given area about x axis.



7. (a) Carom board players employ ———— principle while playing.
   (b) Snow bowling game employs ———— principle.
8. Write the Newton's laws of motion for downward motion.
9. Define angle of repose.
10. What do you mean by general plane motion?

PART B — (5 × 13 = 65 marks)

11. (a) A disabled automobile is pulled by means of two ropes as shown. Knowing that the tension in rope AB is 3750 N, Determine by trigonometry the tension in rope AC and the value of α, so that the resultant force exerted at A is a 6000N force directed along the axis of the automobile.

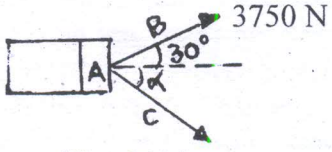
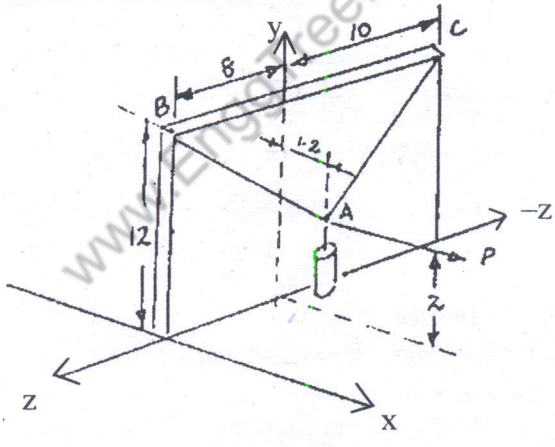


Fig. 11(a)

Or

(b) A 200 kg cylinder is hung by means of two cables AB and AC, which are attached to the top of a wall. A horizontal force P perpendicular to the wall holds the cylinder in the position shown. Determine the magnitude of P and the tension in each cable.



All dimensions are in mm.

Fig. 11(b)

12. (a) (i) For the brake pedal shown in fig. 12(a)(i), determine the magnitude and direction of the smallest force P which has a 104 Nm clockwise moment about B.

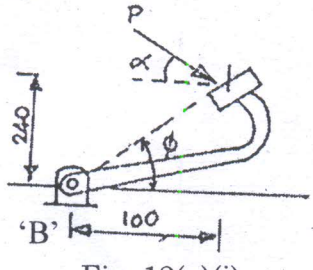


Fig. 12(a)(i)

(ii) A 300 N force is applied at A as shown in fig 12(a)(ii). Determine
(1) The moment of force about D
(2) The smallest force applied at B, which creates same moment.

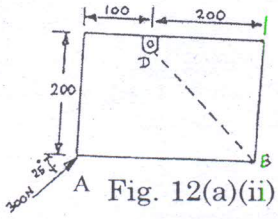


Fig. 12(a)(ii)

Or

(b) Find the reaction at A and B for the beam loaded as shown in fig. 12(b).

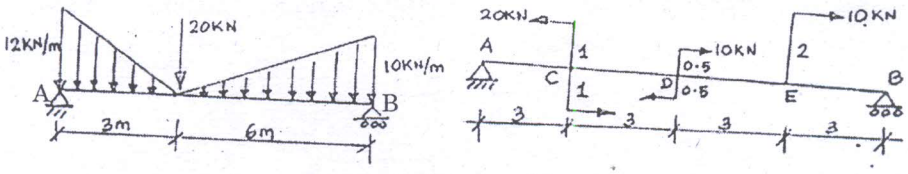


Fig. 12(b)

13. (a) Find the centroid of the shaded area shown in fig. 13(a) about X and Y axes.

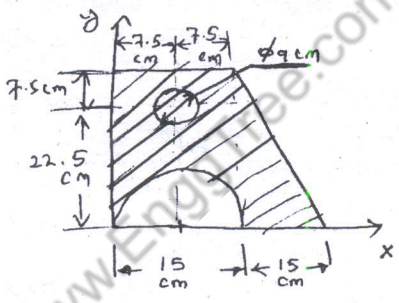


Fig. 13(a)

Or

(b) Find second moment of area of the shaded section shown in fig. 13(b) about its centroidal axes.

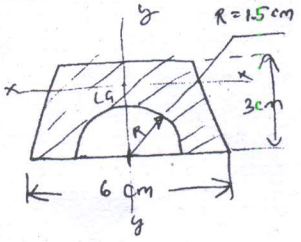


Fig. 13(b)

14. (a) An object weighing 80 N is pulled up on the smooth plane by a 75 N force as shown in fig. 14(a). Determine the velocity of the object after it has moved 4m.

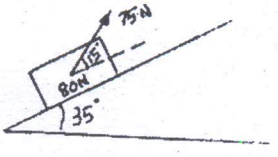


Fig. 14(a)

Or

(b) The magnitudes and directions of the velocities of two identical smooth balls before they strike each other are as shown in fig. 14(b). Assuming e = 0.6, determine the magnitude and direction of velocity of each ball after impact.

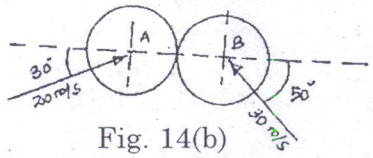


Fig. 14(b)

15. (a) A body resting on a horizontal plane required a pull of 200N inclined at 40° to the plane to initiate the motion. It was also found that a push of 250N inclined at 40° to the plane, just moved the body as shown in fig 15(a). Determine weight of the body and Co- efficient of friction.

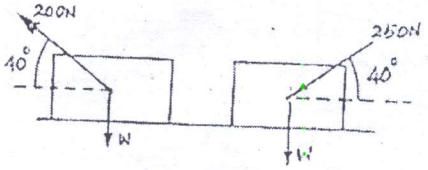


Fig. 15(a)

Or

(b) A block of weight 1600N is in contact with a place incline 30° to horizontal. A force 'P' parallel to the plane and acting up the plane $\mu = 0.2$. Find

(i) The value pf 'P' to just cause the motion.
(ii) The value of 'P' to prevent motion
(iii) The magnitude and direction of frictional force.

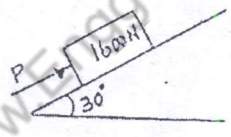


Fig. 15(b)

PART C — (1 × 15 = 15 marks)

16. (a) Derive the expression for mass moment of inertia of sphere of radius R, about y axis.

Or

(b) Figure 16(b) shows configuration of an engine mechanism. The dimensions are the Crank OA = 200 mm; Connecting rod AB = 600 mm ; distance of centre of mass from crank end, AD = 200 mm. At the instant, the crank has an angular velocity of 50 rad/s clockwise and an angular acceleration of 800 rad/s^2. Calculate the

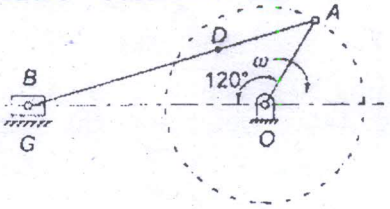


Fig. 16(b)

(i) velocity of D and angular velocity of AB
(ii) Acceleration of D and angular acceleration of AB
(iii) Point on the connecting rod which has zero acceleration at this instant.