



C09-M-303

3247

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH/APRIL—2014

DME—THIRD SEMESTER EXAMINATION

ENGINEERING MECHANICS

Time : 3 hours]

[Total Marks : 80

PART—A

3×10=30

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. State triangle law of forces and the Lami's theorem.
2. A gun of mass 30 tonnes fires a 456 kg projectile with a velocity of 305 m/s. With what velocity will the gun recoil?
3. Define amplitude, periodic time and frequency.
4. Define coefficient of friction and angle of friction.
5. Find the horizontal effort to move the body weighing 90 N along a horizontal plane. The plane is such that if it is gradually raised up to 15°, the body will slide down.
6. Define reversible machine and self-locking machine.
7. In a simple lifting machine an effort of 30 N raised a load of 1200 N. What is the mechanical advantage? If the machine has an efficiency of 60%, what is the velocity ratio?

- * 8. State the parallel axis theorem.
9. Find the moment of inertia of rectangular lamina of 40 mm wide and 80 mm deep with respect to centroidal axes.
10. State the differences between machine and structure.

PART—B

10×5=50

Instructions : (1) Answer *any five* questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. Determine analytically the magnitude and direction of the equilibrant of the forces shown in Fig. 1. Find the angle made by it with OX.

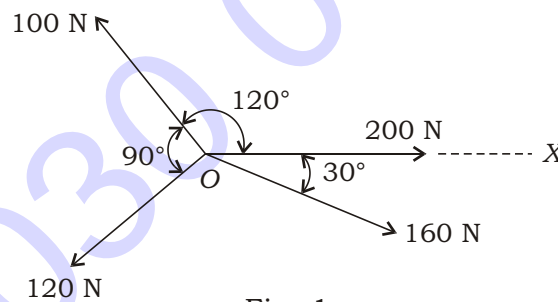


Fig. 1

12. (a) A point is moving with uniform acceleration. In the eleventh and fifteenth seconds from the commencement it moves through 7.2 m and 9.6 m respectively. Find its initial velocity and the acceleration with which it moves.

(b) An engine capacity 1.5 MW acts on a body so that its velocity changes from 10 m/s to 25 m/s in 6 minutes. Calculate the mass of the body.

13. A body resting on a rough horizontal plane required a pull of 90 N inclined at 30° to the plane just to move it. It was also found that a push of 110 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction.

- * **14.** A ladder 5 m long and 245 N weight is placed against a vertical wall in a position where its inclination to the vertical is 30° . A man weighing 784 N climbs the ladder. At what position will he induce slipping? The coefficient of friction for both the contact surfaces of the ladder, i.e., with the wall and the floor is 0.2.
- 15.** (a) A circular automobile track has a radius of 183 m. The track is so designed that when a car travels at a speed of 193 kmph, the force between the automobile and the track is normal to the surface of the track. Find the angle of banking.
- (b) In lifting machine an effort of 240 N raises a load of 1800 N. The velocity ratio of the machine is 9. Calculate the effect of friction and efficiency at this load.
- 16.** In differential wheel and axle the difference between axle diameter is 50 mm and the diameter of the effort wheel is 750 mm. If the load of 2500 N is lifted by an effort of 160 N and a load 3250 N is lifted by an effort of 200 N, calculate the load lifted by an effort of 225 N. Also calculate mechanical advantage and efficiency.
- 17.** Find the moment of inertia of the channel section as shown in Fig. 2 about centroidal axes XX and YY :

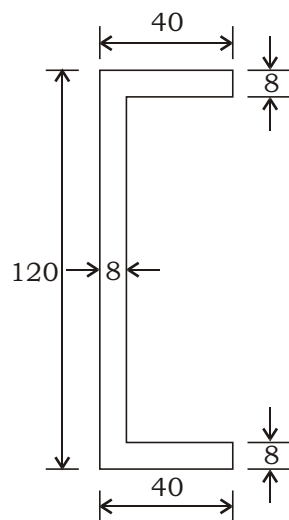


Fig. 2 (All dimensions are in mm)

- * **18.** (a) Find the centroid of L-section shown in Fig. 3 :

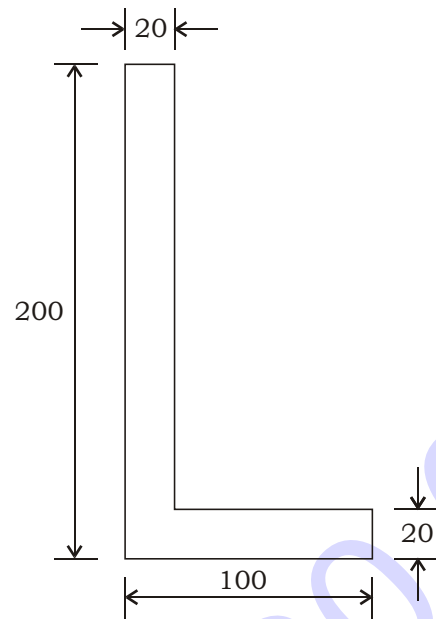


Fig. 3 (All dimensions are in mm)

- (b) Explain the steering gear mechanism with neat sketch.