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**BOARD DIPLOMA EXAMINATION, (C-16)**

**JUNE/JULY—2022**

**DME - FIRST YEAR 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) Answers should be brief and straight to the point and shall not exceed five simple sentences.

1. State the Lami's theorem and write the relevant formula.

2. Two forces 10 N and 12 N act simultaneously at a point. Find the resultant force if the angle between them is 60°.

3. Define the following terms :

(a) Angle of friction

(b) Angle of repose

4. State any three laws of solid friction.

5. Define the following terms :

(a) Moment of inertia

(b) Radius of gyration

6. Define centrifugal force. Give two examples where this force comes into play.

7. State the D'Alembert's principle.

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8. Define the following terms :

   (a) Velocity ratio

   (b) Mechanical advantage

9. Write the difference between a reversible machine and self-locking machine.

10. List out any three names of inversions of four bar chain.

## PART—B                                                                10×5=50

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

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

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

11. The following forces act at a point :

    (a) 30 N towards East

    (b) 25 N towards North

    (c) 35 N towards West

    (d) 45 N towards south

    Find the magnitude and direction of resultant force.

\* 12. 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 weight of the body and the coefficient of friction.

13. (a) The resultant of two equal forces acting at a point with an angle of 60° between them is 17·32 N. Find the magnitude of each force.

    (b) Find the moment of inertia of rectangular lamina of 30 mm wide and 70 mm deep about its centroidal axes. Also find its least radius                    of                    gyration.

**14.** Find the moment of inertia about centroidal axes for the given I-section. The dimensions are as follows :

| | | |
|---|---|---|
| Top flange | : | 100 mm × 20 mm |
| Web | : | 20 mm × 100 mm |
| Bottom flange | : | 120 mm × 30 mm |

**15.** A bullet of mass 0·1 kg is fired into a target with a velocity of 350 m/s. The mass of the target is 10 kg and it is free to move. Find the loss of kinetic energy.

**16.** A wheel rotating about a fixed axis at 45 r.p.m is uniformly accelerated for 60 seconds during which it makes 50 revolutions. Find :

*(a)* Angular velocity at the end of this interval and

*(b)* Time required for the speed to reach 90 r.p.m.

**17.** An effort of 303·8 N is required to lift 9800 N and effort of 597·8 N is required to lift 19600 N using a simple machine. Find the load lifted using an effort of 156·8 N on that machine.

**18.** *(a)* Draw the line diagram of second system of pulleys and write the formula for its velocity ratio.

*(b)* Explain the Pantograph mechanism with a neat sketch.

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