4054

BOARD DIPLOMA EXAMINATION, (C–14)
OCT/NOV—2017
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) Answer should be brief and straight to the point and shall and not exceed *five* simple sentences.

1. Define the terms 'couple' and 'moment of couple' with a neat sketch.

2. State the parallelogram law of forces.

3. Define the following terms :

   (a) Coefficient of friction

   (b) Normal reaction.

4. Define static friction and dynamic friction.

5. A hollow circular section has an external dia of 8 cm and internal diameter of 6 cm. Find its MI about the horizontal axis passing through its centre.

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6. The piston of the steam engine moves with SHM, the crank rotates at 120 r.p.m. with a stroke of 2 m. Find the velocity and acceleration of the piston when it is at a distance of 0·75 meter from the centre.

7. Define law of conservation of energy.

8. What is a simple machine? List out any three simple machines.

9. The law of the machine is $p \quad 0 \quad 04w \quad 2$. If VR = 50, what is the MA and efficiency when $W \quad 200$ N?

10. List three examples of lower and higher pairs.

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**PART—B**   10×5=50

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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. The forces acting at a point are given below :

   (a) 15 N inclined at 30° towards North to East

   (b) 20 N towards North

   (c) 25 N towards North-West

   (d) 30 N inclined at 40° towards South of West. Find the magnitude and direction of resultant of the forces.

12. A body resting on a rough horizontal plane required a pull of 180 N inclined at 30° to the plane just to move it. It was found that a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction.

13. Find the MI of a T-section shown in the figure below about *x-x* axis passing through the CG of the section :
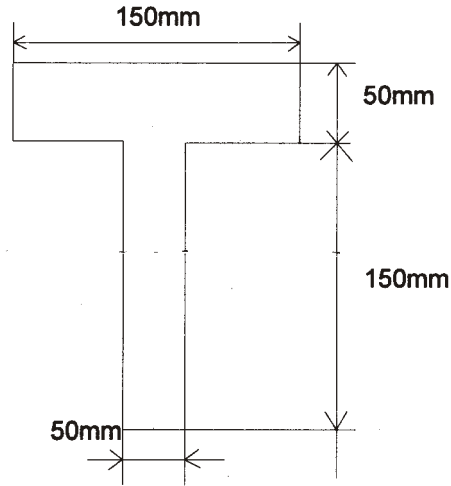
14. *(a)* Determine the horizontal and vertical components of a force of 150 N acting on a rigid body at an angle of 20° with the horizontal.

(b) In a rectangular lamina 100 mm × 120 mm a rectangular opening *PQRS* 30 mm × 40 mm is made as shown in the figure below. Find the centroid of the lamina :
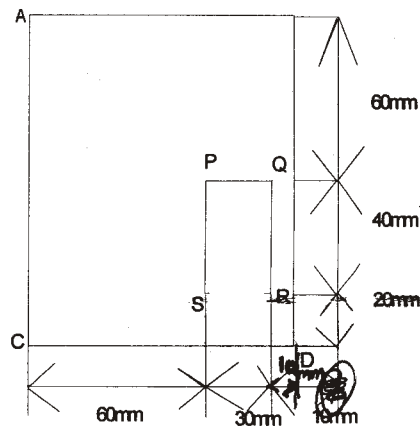
15. A piston moving with SHM has a velocity of 4 m/s, when it is 2 meters from the centre. Find *(a)* amplitude, *(b)* periodic time, *(c)* maximum velocity and *(d)* maximum acceleration.

16. A body is vertically projected upward with a velocity of 7·2 m/s. How long will it take to reach a point 84 m below the point of projection?

17. An effort of 200 N is applied to a lifting machine to raise a load out of which 10% is lost in friction. If VR of the machine is 10, determine *(a)* the load lifted and *(b)* efficiency.

18. *(a)* What are the conditions for maximum MA and maximum efficiency of simple machines?

    (b) Explain kinematic pair and kinematic chain with neat sketches.

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