



C09-M-303

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BOARD DIPLOMA EXAMINATION, (C-09)

APRIL/MAY—2015

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. Define force. Write the specifications of force.
2. With reference to simple harmonic motion, define (a) amplitude, (b) time period and (c) frequency.
3. State the law of conservation of momentum and express it mathematically.
4. Explain the principle of screw jack.
5. State the laws of dynamic friction.
6. Define (a) mechanical advantage, (b) velocity ratio and (c) efficiency.

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7. State the <sup>\*</sup> condition for self-locking and reversibility of a simple machine.
8. Define moment of inertia of a plane figure and express it mathematically.
9. The radius of gyration of I-section is 82 mm and its area is 5000 mm<sup>2</sup>. Find its moment of inertia.
10. Differentiate between machine and mechanism. Give one example of each.

**PART—B**

10×5=50

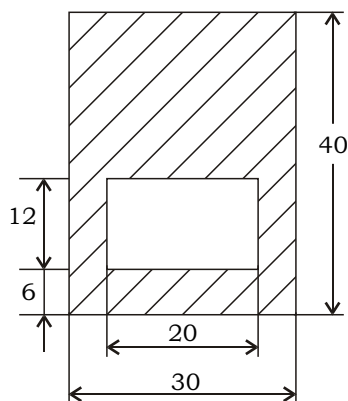
**Instructions** : (1) Answer *any five* questions.

(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. A wheel is rotating at 30 r.p.m. It is uniformly accelerated for 50 seconds during which it makes 40 revolutions. Find (a) angular velocity at the end of this interval and (b) time required to reach a speed of 80 r.p.m.
12. A roller of diameter 500 mm and weight 1400 N is to be taken up a step 50 mm high. Find the magnitude and direction of the minimum effort required to pull up the roller.
13. A body resting on a horizontal plane required a pull of 180 N inclined at 30° to the plane just to move it. It was also found that a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and coefficient of friction.
14. A body resting on a rough horizontal plane required a pull of 90 N inclined at 30° to the plane to just 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.

15. In a lifting machine, an effort of 98 N lifts a load of 2450 N and an effort of 127.4 N lifts a load of 3920 N.
- Establish the law of the machine.
  - Calculate the effort required to lift a load of 5880 N.
  - Find the load that can be lifted using an effort of 196 N.
  - What is the maximum efficiency of the machine, assuming VR as 75?
  - What is the effort lost in friction?
16. (a) Illustrate the centroid of (i) square, (ii) semicircle and (iii) triangle.  
 (b) Find the centre of gravity of a hemisphere of radius 40 mm.
17. (a) A car is moving at a speed of 60 kmph. The brakes are applied and the speed is reduced to zero in 5 seconds. Find the retardation and distance covered by the car after applying brakes.  
 (b) In a first system of pulleys there are three movable pulleys and a weight of 320 N can be supported by an effort of 50 N. Find the efficiency of the machine.
18. (a) Find the centroid of the shaded region shown below :



- (b) Explain briefly the oscillating cylinder engine with a neat sketch.

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