

**3247**  
**BOARD DIPLOMA EXAMINATION, (C-09)**  
**MARCH/APRIL - 2019**  
**DIPLOMA IN MECHANICAL ENGINEERING**  
**ENGINEERING MECHANICS**  
**THIRD SEMESTER EXAMINATION**

**Time: 3 Hours**

**Total Marks: 80**

**PART - A (10 x 3 = 30 Marks)**

*Note 1: Answer all questions and each question carries 3 marks*

*2: Answers should be brief and straight to the point and shall not exceed 5 simple sentences*

1. A vehicle of mass 1000 kg acquires a velocity of 20 m/s in 10 seconds starting from rest. Find its power.
2. Define the following terms and give one example for each of them  
a) Scalar quantities b) Vector quantities
3. If the maximum acceleration and time period of a particle executing SHM are  $5\text{m/s}^2$  and 6.28 seconds, respectively, find the amplitude.
4. Define the following a) Static friction b) Limiting friction
5. Find the horizontal effort to move the body weighing 90 N along a horizontal plane. The roughness of the plane is such that if it is gradually raised to  $15^\circ$  the body will slide down.
6. Differentiate between an ideal machine and a practical machine
7. Illustrate the second order lever with a practical example
8. A T-section is made up of a flange of 80mm x 15mm and a central web of 60mm x 15mm. Locate its centroid.
9. State perpendicular axis theorem and express it mathematically.
10. What is a straight line mechanism? Name any two straight line mechanisms

**PART - B (5 x 10 = 50 Marks)**

*Note 1: Answer any five questions and each question carries 10 marks*

*\* 2: The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer*

11. Find the magnitude and direction of the single force that brings the following system of coplanar, concurrent forces into equilibrium.
  - (i) A force of 20 N acting due east
  - (ii) A force of 25 N acting  $40^\circ$  north of east
  - (iii) A force of 10 N acting  $50^\circ$  west of north
  - (iv) A force of 30 N acting vertically downwards
12. A wheel is rotating at 30 rpm. 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 rpm
13. A body resting on a rough horizontal plane required a pull of 90 N inclined at  $30^\circ$  to the plane to just move it. It was also found that a push of 100 N inclined at  $30^\circ$  to the plane just moved the body. Determine the weight of the body and the co-efficient of friction

14. A load of 20 KN is lifted by a screw jack. The mean diameter of thread is 75 mm. Pitch of the thread is 12 mm. Coefficient of friction is 0.075. Effective mean radius of bearing surfaces is 60 mm. Determine the torque required to raise the load.
15. Draw a neat sketch of second system of pulleys. Derive an expression for its velocity ratio.
16. A T-section is made up of a top flange of 50mm x 10mm and a central web of 80mm x 10mm. Determine its moments of inertia about horizontal and vertical axes passing through its Centroid.
- 17A. A body is projected vertically upwards with a velocity of 12 m/s. Find the maximum height attained by the body and the velocity at 5 m height
  - B. In a lifting machine an effort of 240 N raises a load of 1800N. The velocity ratio of the machine is 9. Calculate effort lost in friction and efficiency at this load.
- 18A. Find the centroid of a trapezium of sides 50mm, 70mm and height 60mm.
  - B. Explain the coupling rods of locomotive with a neat sketch.

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