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C-14-M-105

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BOARD DIPLOMA EXAMINATION, (C-14)

OCT/NOV—2016

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 force and write any two specifications of force.
2. State the parallelogram law of forces.
3. List out various types of friction.
4. Find the horizontal effort to a body weighing 70 N placed on a horizontal plane. The coefficient of friction between the two planes is 0.2.
5. Write the coordinates for the centroid of plane geometrical shapes (a) circle and (b) square.
6. A bullet of mass 50 gm possesses a KE of 15000 joules. What is its velocity?
7. Define angular displacement, angular velocity and angular acceleration.

- \* 8. Write the expressions for the velocity ratio of first, second, third system of pulleys.
9. Draw the diagram of differential pulley block and write the expression for finding the velocity ratio.
10. What is lower pair? Mention two examples of lower pair.

**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 lamp weighing 8 N is suspended from the ceiling by means of a wire. It is pulled to one side by a horizontal cord, until the wire makes an angle of  $60^\circ$  with the ceiling. Find the tension in the wire and cord. 10

12. A body of weight 300 N is just pulled up a plane inclined at  $30^\circ$  to the horizontal by a force of 400 N inclined at  $30^\circ$  with the plane. Find the coefficient of friction between the body and the plane. 10

13. An angle section is specified as 100mm 50mm 10mm. Determine the moment of inertia about its centroidal axes. 10

\* 14. (a) Find the moment of inertia of a rectangular lamina of 40 mm wide and 80 mm deep. Find also the least radius of gyration and modulus of the section. 5

(b) The resultant of two given forces is equal to each of the forces. Find the angle between the forces. 5

- \* 15. A bullet of a gun of mass 0.05 kg and is fired with a velocity of 300 m/s. What is the kinetic energy of the bullet? If the bullet penetrates into a block of wood 300 mm deep, what is the resistance offered by wood to the bullet? What is the exit velocity of the bullet if the same bullet is fired into a similar block of wood of 200 mm thick? 10
16. A wheel rotating about a fixed axis at 20 r.p.m. is uniformly accelerated to 70 seconds during which time it makes 50 revolutions. Find the (a) angular velocity at the end of this interval and (b) time required for the speed to reach 100 rev./min. 10
17. A double-purchase crab has the following dimensions :
- Effective diameter of the load drum = 180 mm
  - Length of the handle = 380 mm
  - No. of teeth on pinions = 20 and 30
  - No. of teeth on spur wheels = 75 and 90
- When tested it was found that an effort of 80 N was required to lift a load of 1600 N and an effort of 135 N was required to lift a load a 3150 N.
- Determine (a) law of machine, (b) probable effort to lift a load of 6000 N, (c) efficiency in the above case and (d) maximum efficiency. 10
18. (a) A weight of 1200 N is lifted by an effort of 250 N, by second system of pulleys, having 5 pulleys in each block. Calculate the amount of friction wasted and frictional load. 5
- (b) Explain the Watt's mechanism along with a neat sketch. 5

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