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C09–M–303

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BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2017

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

1. Define the following :

(a) Statics

(b) Kinetics

(c) Kinematics

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. What is the difference between centripetal force and centrifugal force?

4. What is friction? What are the types of friction?

5. Define *(a)* angle of friction and *(b)* angle of repose.

6. What is simple machine? List out any three simple machines.

7. The velocity ratio of a simple machine is 8. The effort applied is 220 N. Determine the efficiency, if the load lifted is 1600 N.

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8. Define *(a)* centre of gravity and *(b)* centroid.

9. State parallel axis theorem.

10. Differentiate between a machine and mechanism.

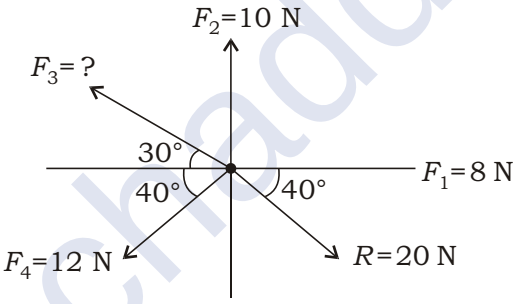
PART—B 10×5=50

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 system of forces is acting on a particle as shown in Determine the magnitude and direction of the third force the figure below :



12. The bullet of gun is of mass 0·03 kg and is fired with a velocity of 500 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 exit velocity, if the same bullet is fired into a 150 mm thick wood?

13. A body resting on a rough horizontal plane required a pull of 80 N inclined at 40° to the plane just to move it. It was also found that a push of 120 N inclined at 30° to the plane just moved by the body. Find the *(a)* weight of the body and *(b)* coefficient of friction.

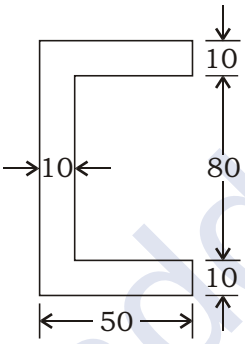
14. A mass of 50 kg is pulled up a rough inclined plane whose inclination to the horizontal is 30° by a force of 354 N acing parallel to the plane. Find the coefficient of friction solve by resolution of forces. Take, g 9 81 m / sec^2.

15. A crowbar of length 2 m is lifting a weight of 800 N. The crowbar is supported at 0·6 m from the load. Determine the velocity ratio and the effort to be applied at the end of crowbar.

16. *(a)* Derive the relation between efficiency, mechanical advantage and velocity ratio.

(b) Find the MI of a rectangular lamina of 60 mm wide and 500 mm deep with respect to the centroidal axis.

17. Find the moment of inertia of channel section as shown in the figure below and also find the radius of gyration.



All dimensions are in mm

18. *(a)* A weight of 100 N is suspended by two ropes one of which is horizontal and the other is inclined at an angle of 40° to the horizontal. Find the tension in the inclined rope.

(b) Explain with worth-quick return mechanism with a neat sketch.

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