



C09-M-303

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BOARD DIPLOMA EXAMINATION, (C-09)
MARCH/APRIL—2018
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. Differentiate between linear motion and circular motion.
2. If the maximum acceleration and time period of a particle executing SHM are 5 m/s^2 and 6.28 seconds respectively, then find the amplitude.
3. A vehicle of mass 1000 kg acquires a velocity of 20 m/s in 10 seconds starting from rest. Find its power.
4. Calculate the effort required to raise a load of 1200 N using a screw jack. The helix angle of screw jack is 25 degrees and coefficient of friction is 0.1.
5. Define the following :
 - (a) Static friction
 - (b) Limiting friction

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6. List out any six simple machines.
7. Differentiate between reversible and self-locking machines.
8. Illustrate the polar moment of inertia of a circular lamina about an axis passing through its centre.
9. The radius of gyration of I-section is 82 mm and its area is 5000 mm^2 . Find its moment of inertia.
10. Draw a neat sketch of Watt's indicator 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. The following forces act at a point :

(a) 25 N inclined at 35° towards North of East

(b) 20 N towards North

(c) 30 N towards North-West

(d) 20 N inclined at 20° towards South of West

Find the magnitude and direction of the resultant force.

12. (a) State the meaning of mechanics in engineering and explain some of its applications to engineering.

(b) Differentiate between scalar and vector quantities.

13. A body of weight 500 N is just moved up a plane which is 30° to the horizontal. The force applied is 400 N at 20° to the plane. Find the coefficient of friction.

14. 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.

- 15.** (a) ^{*} 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.
- (b) Calculate the effort required to lift a load of 5880 N.
- (c) Find the load that can be lifted using an effort of 196 N.
- (d) What is the maximum efficiency of the machine assuming VR as 75?
- (e) What is the effort lost in friction?
- 16.** (a) Differentiate between centroid and centre of gravity.
- (b) Find the centroid of a trapezium of sides 60 mm, 80 mm and height 50 mm.
- 17.** (a) A car of mass 1000 kg moves on a level road under the action of 981 N of propelling force. Find the time taken by the car to increase its velocity from 24 kmph to 48 kmph, and the distance travelled during this time.
- (b) A simple screw jack has threads of 5 mm pitch. The effort is applied at the end of a lever 500 mm long. What is the effort required to lift a load of 10 kN? Take the efficiency of the machine as 40%.
- 18.** (a) An I-section is made up of a top flange—100 mm 20 mm, web—120 mm 30 mm, bottom flange—160 mm 30 mm. Locate its centroid.
- (b) Explain the coupling rods of locomotive with a neat sketch.

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