



C16-M-105

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BOARD DIPLOMA EXAMINATION, (C-16)
SEPTEMBER/OCTOBER - 2020
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) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. State the following : 1½+1½
 - (a) Triangle law of forces
 - (b) Lami's theorem
2. The horizontal and vertical components of a given force are 100 N and 80 N. Find the magnitude and direction of a given force.
3. Define the following terms : 1½+1½
 - (a) Normal reaction
 - (b) Coefficient of friction
4. The effort required to move a load of 10 kN up the plane of 30° angle with horizontal is 7250 N. Find the coefficient of friction, if the effort applied is parallel to the plane.

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5. Find the ^{*} moment of inertia of rectangle of width 50 mm and depth 80 mm about centroidal axes I_{XX} and I_{YY} .
6. Define the following terms : 1+1+1
 (a) Amplitude
 (b) Periodic time
 (c) Frequency
7. A stone is thrown vertically upwards with a velocity of 20 m/s from the ground. Find the maximum height reached by a particle.
8. Define the following terms with respect to simple machine : 1+1+1
 (a) Ideal machine
 (b) Ideal effort
 (c) Ideal load
9. A wheel and axle are used to lift a load of 200 N from which an effort of 50 N is required. The diameter of the wheel is 400 mm and that of axle is 80 mm. Find the efficiency of the machine at this load.
10. List three inversions of a single-slider crank chain mechanism.

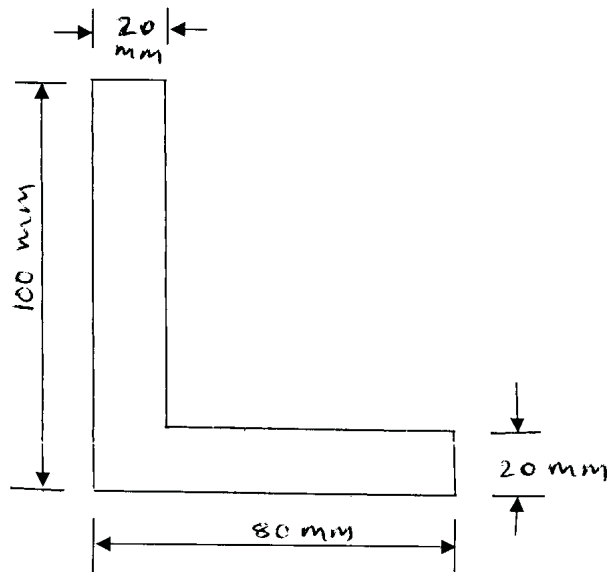
PART—B

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 forces act at a point 20 N inclined at 30° towards North of East, 25 N towards North, 30 N towards North-West and 35 N inclined at 40° towards South of West. Find the magnitude and direction of the resultant force.

12. A body of weight 1000 N is to be pulled up an inclined plane of angle 20° . Coefficient of friction between body and plane is 0.25. Find the effort required (a) when it is parallel to the plane and (b) when it is inclined to the plane at 10° .
13. Find the moment of inertia of the angle section shown in figure below about XX and YY axes passing through its center of gravity :



14. (a) Find the magnitude and direction of the resultant of two forces of 100 N and 60 N act at a point, if the angle between the two forces be 45° . 5
- (b) Find the polar moment of inertia of a hollow circular section of outer diameter 60 mm and inner diameter 30 mm. 5
15. A bullet of mass 0.1 kg is fired into a target with a velocity of 350 m/s. The mass of the target is 10000 grams and it is free to move. Find the loss of kinetic energy.
16. A body moving with simple harmonic motion has an amplitude of 1 m and period of oscillation of 2 seconds. What will be its velocity and acceleration after 0.4 second after passing an extreme position?

17. The larger and smaller diameters of differential axle are 80 mm and 70 mm respectively. The effort is applied to the wheel at the end of the lever 120 mm long. What is the velocity ratio? Find also the efficiency and frictional effort lost, when the load lifted is 8000 N and the effort applied is 320 N.
18. (a) There are four pulleys arranged in third system of pulleys. Find the effort required to lift a load of 6000 N. Assume efficiency of the machine as 85%. 4
- (b) Explain Whitworth quick return mechanism with a neat sketch. 6

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