C14-M-105

4054

BOARD DIPLOMA EXAMINATION, (C-14)

OCT/NOV—2015

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 not exceed *five* simple sentences.

1. Define equilibrium and equilibrant

2. State the Lami's theorem.

3. List any three laws of dynamic friction.

4. What is cone of friction?

5. State the parallel axis theorem.

6. A body projected vertically upwards with a velocity of 18 m/s. Find the maximum height attained by it.

7. Define work, power and energy.

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

9. In a system of pulleys of the first type there are three movable pulleys and a weight of 320 N can just be supported by an effort of 50 N. Find the efficiency of the machine.

10. Define *(a)* link and *(b)* kinematic 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. The following forces act at a point :

(a) 30 kN inclined at 35° towards North to East.

(b) 22 kN towards North.

(c) 30 kN inclined at 30° towards North of West.

(d) 35 kN inclined at 25° towards South of West.

Find the magnitude and direction of the resultant force. 10

12. A body weighing 500 N is placed on a rough horizontal plane and is pushed by a force of 100 N inclined at an angle of 20° with the horizontal. Find the coefficient of friction. 10

13. An I-section is made up of top flange 100 mm × 20 mm and web 120 mm × 30 mm and bottom flange 160 mm × 30 mm. Determine I_{xx} and I_{yy} of the section. 10

14. *(a)* Resultant of two concurrent forces is 12 N. If the forces are equal and make 120° with each other, find their magnitude and angle, which the resultant makes. 5

(b) Find the moment of inertia of rectangular lamina of 30 mm wide and 70 mm deep about its centroidal axes. Find also least radius of gyration. 5

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15. A body moves for 3 seconds with a constant acceleration during which time it describes 81 m. the acceleration then ceases and the next 3 seconds it describes 72 m. Find its initial velocity and its acceleration. 10

16. A fly wheel increases its speed from 30 RPM to 60 RPM in 10 seconds. Find the number of revolutions made by the wheel in 10 seconds and its angular acceleration. 10

17. In a lifting machine, an effort of 150 N raised a load of 7700 N. What is the mechanical advantage? Find the velocity ratio, if the efficiency at this load is 60%. If on the machine an effort of 250 N raises a load of 13200 N, what is the efficiency? What will be the effort required to raise a load of 5000 N? Calculate the maximum mechanical advantage and maximum efficiency. 10

18. (a) In a differential pulley block, the number of teeth on larger and smaller pulleys are and 12 respectively. Find the effort needed to raise a weight of 200 N, assuming the efficiency as 80%. 5

(b) Explain the pantograph mechanism with a neat sketch. 5

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