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Total No. of Pages : 04

Total No. of Questions : 18

B.Tech. (EE / Electrical & Electronics Engg.) (2018 Batch)
B.Tech. (Electronics & Electrical Engg.) (2018 Batch) (Sem.–3)

ENGINEERING MECHANICS

Subject Code : BTXX-XXX-18
M.Code : 76385

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Write briefly :

1. Differentiate between symmetric and anti-symmetric tensors.
2. Draw the free body diagram of roller support placed on horizontal plane.
3. Write the parallel axis theorem and explain each of its term.
4. Define angle of repose.
5. Define principal moment of inertia.
6. Write the relationship between loading and shear force in reference to beams.
7. Write the torsion equation in its usual notations. Also explain each of them.
8. Differentiate between 2-D and 3-D rotational motion.
9. Define radius of gyration.
10. Explain general plane motion.

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SECTION-B

11. Three ropes are attached to the post at A (Fig. 1). The forces in the ropes are $F_1 = 260$ N, $F_2 = 75$ N, and $F_3 = 60$ N. Determine the magnitude of the force R that is equivalent to the three forces shown in the figure. 1

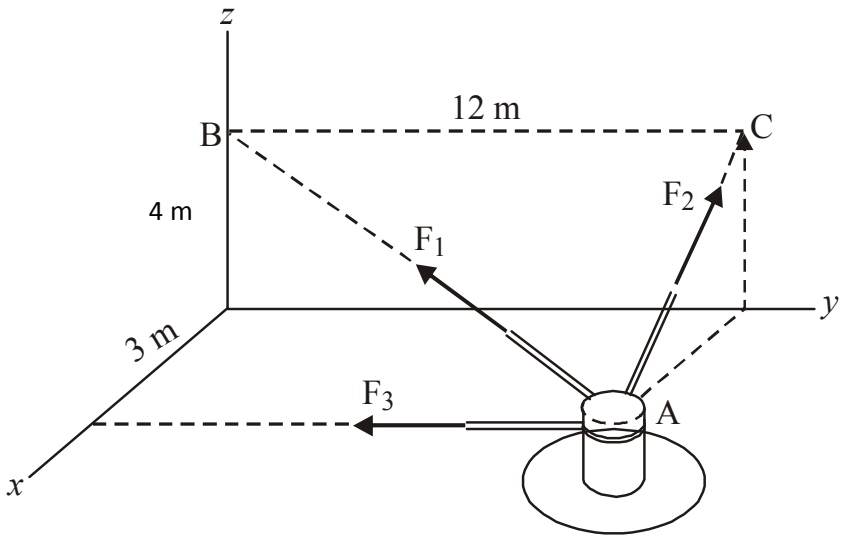

FIG.1

12. Calculate the moment of inertia of the shaded area about the y-axis (Fig. 2) by using double integration method.

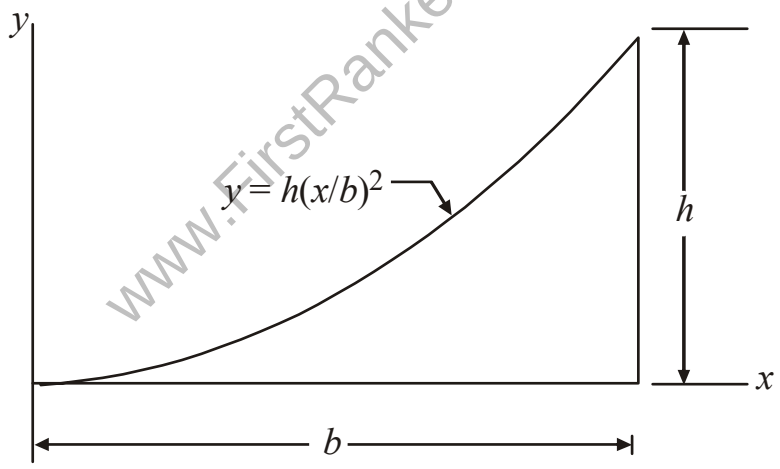

FIG.2

13. Write the five terms acceleration formula in scalar and vector form. Explain each of its terms briefly.

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14. Determine the smallest angle θ for which the slender bar (Fig. 3) can remain at rest. The bar is homogeneous of weight *W* and length *L*. Neglect friction between the bar and wall at *B* point.

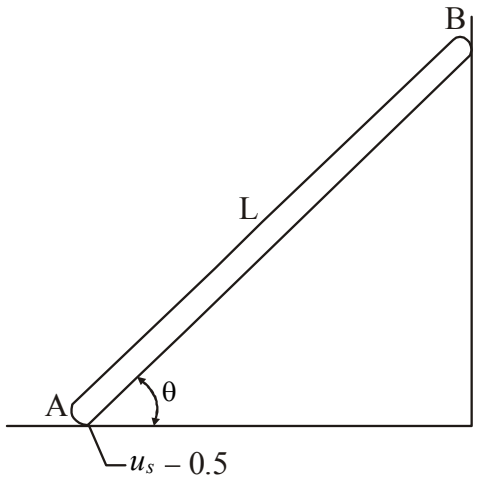

FIG.3

15. In a pin jointed four bar mechanism, (Fig. 4), *AB* = 300 mm, *BC* = *CD* = 360 mm and *AD* = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 rpm. Locate all instantaneous centre and find angular velocity of the link BC.

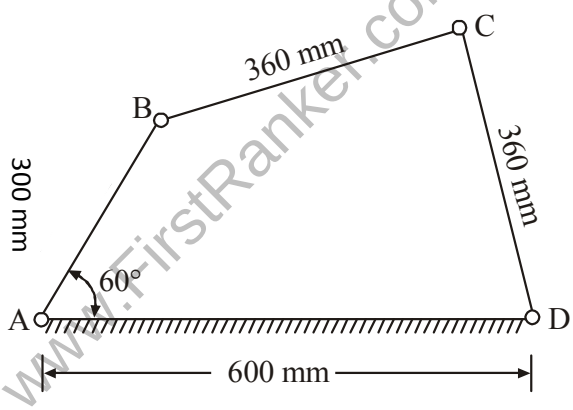

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FIG.4

SECTION-C

16. A solid steel shaft of 2 m length is to transmit 50 kW at 150 rpm. If the shear stress in the shaft material is not to exceed 50 MPa and maximum allowable twist in the shaft is 1°, calculate the safe shaft diameter. Assume G as 80 GPa.

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17. For the beam (Fig. 5), draw the shear force and bending moment diagrams. Neglect the weight of the beam.

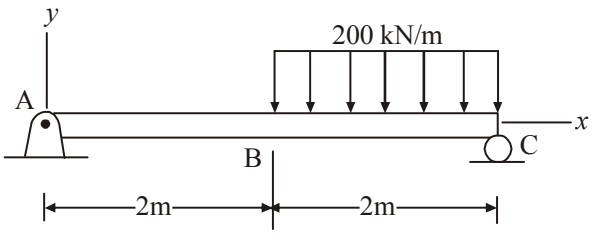

FIG.5

18. The electric motor with an attached disk is running at a constant low speed of 120 rpm in the direction as shown in Fig. 6. Its housing and mounting base are initially at rest. The entire assembly is next set in rotation about the vertical Z-axis at the constant rate N = 60 rpm with a fixed angle $\gamma = 30°$. Determine : a) the angular velocity and angular acceleration of the disk, b) the space and body cone, and c) the velocity and acceleration of point A at the top of the disk for the instant shown in the figure 6.

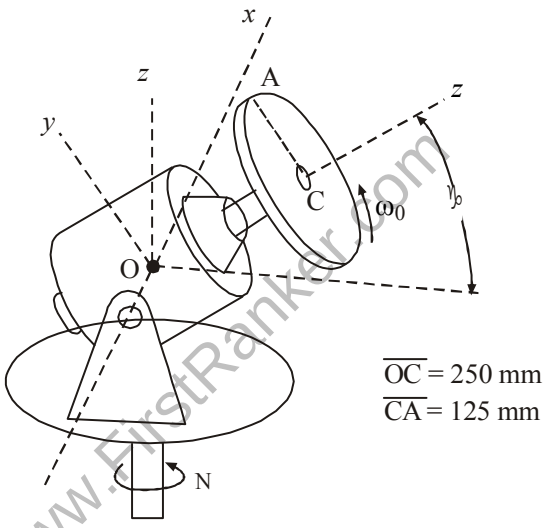

FIG.6

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.

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