Roll No. | | | | | | | | | | | | |  Total No. of Pages : 03

Total No. of Questions : 09

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

**1. Write briefly :**

a) Explain law of mechanics.

b) What is Eigen value?

c) Explain Vector quantities.

d) Define the free body diagram of a body in an equilibrium system, and explain its importance.

e) The maximum range of a projectile is 2000 m. What should be the angle of elevation so as to obtain a range of 1400 m if the initial velocity remains unchanged?

f) Explain Newton's Second Law of Motion.

g) How would you distinguish between the motions, when it is subjected to

i) Constant acceleration

ii) Variable acceleration

h) Two forces are acting on a body and the body is in equilibrium. What conditions should be fulfilled by these two forces?

i) Define mass moment of inertia and explain the transfer formula for mass moment of inertia.

j) What do you understand by free precession?

## SECTION-B

2. Determine the magnitude of the resultant force by adding the rectangular components of the three forces (Fig.l).

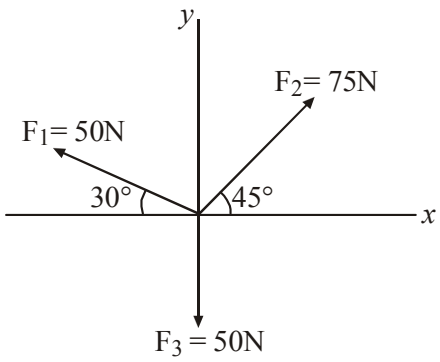


**FIG.1**

3. Define moment of force about a point and show that the algebraic sum of the moments of two coplanar forces about a point is equal to the moment of their resultant about that point.

4. The position coordinate of a particle which is confined to move along a straight line is given by $s = 2t^3 - 24t + 6$, where s is measured in meters from a convenient origin and t is in seconds. Determine :

   a) The time required for the particle to reach a velocity of 72 m/s from its initial condition at $t = 0$,

   b) The acceleration of the particle when v = 30 m/s

   c) The net displacement of the particle during the interval from $t = 1$ s to $t = 4$ s.

5. Determine the position of centroid and calculate the moment of inertia" about its horizontal centroidal axis of a T - beam shown in Fig.2.

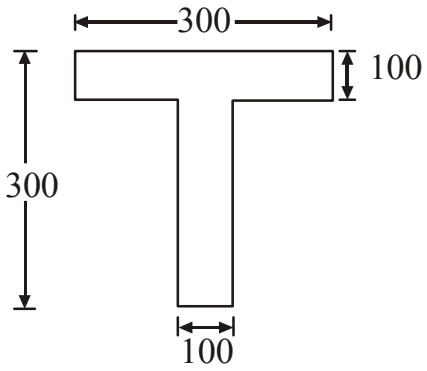


**FIG.2**

6. A dynamics instructor demonstrates gyroscopic principles to his students. He suspends a rapidly spinning wheel with a string attached to one end of its horizontal axle. Describe the precession motion of the wheel.

## SECTION-C

7. a) Derive Euler theorem.

   b) Distinguish kinematics & kinetics.

8. A simply supported beam *AB* of span 6 m is loaded as shown in Fig.3. Determine the reactions at A and B.

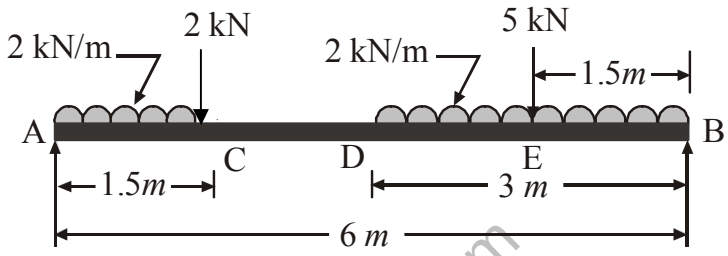


**FIG. 3**

9. A solid steel shaft transmits 100 kW at 150 rpm. Determine the suitable diameter of the shaft if the maximum torque transmitted exceeds the mean 20% in each revolution. The shear stress is not to exceed 60 MPa. Also find the maximum angle of twist in a length of 4 m of the shaft. G = 80 GPa.



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