

007306

Mar. 2022

**B.Tech. (EL) III SEMESTER
Engineering Mechanics (ELES-305)**

Time : 90 Minutes]

[Max. Marks : 25

Instructions :

1. *It is compulsory to answer all the questions (1 mark each) of Part-A in short.*
2. *Answer any three questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART-A

1. (a) Differentiate between vector and tensor. (1)
- (b) Define Symmetric and anti-symmetric tensors. (1)
- (c) What is Euler's theorem? (1)
- (d) Name the different types of motion. (1)
- (e) What is a gyroscopic couple? (1)
- (f) Explain right hand thumb rule. (1)
- (g) Why internal forces are not shown in free body diagram? (1)

- (h) State the condition of equilibrium for a rigid body. (1)
- (i) What is 3D rotation? (1)
- (j) Name different types of beam. (1)

PART-B

- 2. The distance travelled from starting point by a car is proportional to t^3 . During the first 60 seconds, it travels 216 m. find the distance travelled during first 5 seconds after starting. (5)
- 3. Derive an equation for the moment of inertia of a rectangle. (5)
- 4. A simply supported beam 8 m long carries 3 point loads of 100 kN, 150 kN and 200 kN at 2 m, 5 m and 7 m from left roller support. The right hand support is hinged. Draw the shear force and bending moment diagram. (5)
- 5. A hollow shaft is 50 mm outside diameter and 30 mm internal diameter. An applied torque of 1.5 kNm is found to produce an angular twist of 0.4° , measured on a length of 0.2 m of shaft. Calculate the value of the modulus of rigidity. Calculate also the maximum power which could be transmitted by shaft at 2000 rpm, if the maximum allowable shearing stress is 65 MN/m^2 . (5)

- 6. A body of weight 500 N is pulled up along an inclined plane having inclination angle of 30° with the horizontal. If the coefficient of friction between the body and the plane is 0.3 and the force is applied parallel to the inclined plane, determine the force required. (5)
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