

Roll No. ....

**OLE-3044**  
**B. Tech. 3rd Semester (EE)**  
**Examination – April, 2021**

**ENGINEERING MECHANICS**

**Paper : ESC-EE-202-G**

*Time : Three Hours ]*

*[ Maximum Marks : 75*

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*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

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**Note :** Attempt *five* question in all, selecting *one* question from each Section. Question No. 1 is *compulsory*. All questions carry equal marks.

1. (a) What is a tensor in simple terms?  $1.5 \times 10 = 15$
- (b) Define eigenvalues and eigenvectors.
- (c) Define linear and angular momentum equations.
- (d) State work-energy equation.
- (e) Difference between area moment of inertia and mass moment of inertia.

- (f) Write the assumptions, which are made, while finding out the reactions of a beam or a frame having both ends fixed.
- (g) Define the term "support reaction".
- (h) State laws of Coulomb friction.
- (i) Differentiate between center of mass and center of gravity.
- (j) State parallel and perpendicular axes theorems.

**SECTION – A**

- 2.** State and prove Euler's theorem. 15
  
- 3.** A force  $F$  acts at the origin of a coordinate system in a direction defined by the angles  $\theta_x = 68^\circ$  and  $\theta_z = 55^\circ$ . The component of force  $F$  along  $y$  direction is  $-125\text{N}$ . find out : 15
  - (a) angle  $\theta_y$                       (b) Magnitude of force  $F$
  - (c) Component of force along  $X$  and  $Z$  direction

**SECTION – B**

- 4.** Three links are hinged together to form a triangle ABC as shown in fig. 1. At a certain instant, the point A is

moving towards the mid-points of BC with a velocity of 5 m/s and B is moving at a perpendicular direction to AC. Find the velocity of C. 15

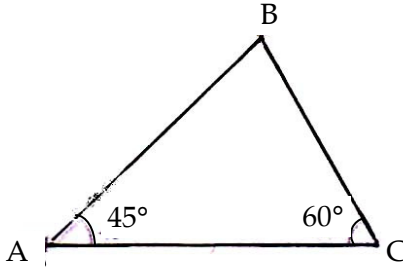


Fig. 1

5. State and prove parallel and perpendicular axis theorem. 15

### SECTION – C

6. Explain free body diagrams with examples. What are the forces included and excluded in when drawing F.B.D ? Also state the method used for the analysis of F.B.D. 15
7. Explain the following with diagram : 15
- (a) General planar motions
  - (b) General 3-D motions
  - (c) Free precession

## SECTION – D

8. Draw the S.F. and B.M. diagrams for the overhanging beam carrying uniformly distributed load of 2 kN/m over the entire length and a point load of 2 kN as shown in fig.2. 15

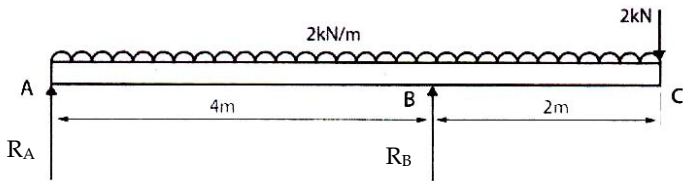


Fig. 2

9. (a) Derive equation of torsion.  $7.5 \times 2$   
(b) State laws of static and dynamic friction.

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