

Roll No. ....

## OLE-24047

### B. Tech. 3rd Semester (ME) Examination – April, 2021

#### COMPUTER AIDED DESIGN

Paper : ME-203-F

*Time : Three Hours ]*

*[ Maximum Marks : 100*

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

1. (a) CAD and CAM.  $2 \times 10 = 20$
- (b) What is difference between 2D transformation and 3D transformation ?
- (c) Write down the scaling and rotation matrix used for 3D transformation.
- (d) Why parametric equations of curves and surfaces preferred over the cartesian equations ?

- (e) Write the properties of Hermite cubic spline.
- (f) How do you validate the open polyhedral and closed polyhedral? Explain.
- (g) Differentiate between absolute coordinate and incremental coordinate system.
- (h) Explain the assembly of matrices of elements in the finite element method.
- (i) Name the different FEA software used in automobile industry.
- (j) What do you understand by CAPP?

### **SECTION – A**

2. (a) Explain the importance and necessity of CAD in industry 4.0. 10
- (b) A rectangle has corner coordinates (10, 20), (40, 20), (40, 40) and (10, 40). This rectangle is rotated by  $30^\circ$  anti-clockwise about (i) origin and (ii) about the point (40, 20). Compute the new coordinates in both cases. 10
3. (a) The concatenated transformation of the graphic elements consists of following operations :
- (i) The translation through 4 and 2 units along X and Y direction respectively.
  - (ii) The change of scale by 2 units in X direction and 4 units in Y direction.

(iii) Rotation by 60 in counter clockwise direction about an axis passing through the point (4, 2).

Write the homogeneous transformation matrices for the above operations and develop the concatenated transformation matrix if the operations are done in above sequence. 10

(b) Explain the different steps involved in design process with suitable example. 10

### SECTION – B

4. (a) Explain the algorithm to generate the Bezier curve for the six given points. 10

(b) Explain types of surfaces used in cad with the help of neat sketches. 10

5. Explain how Boolean operations can be used to construct a geometric model ? How do you define a solid model ? Explain various solid modeling schemes with their applications and limitations. 20

### SECTION – C

6. (a) Define automation and explain types of automation. What are the various levels of automation ? 10

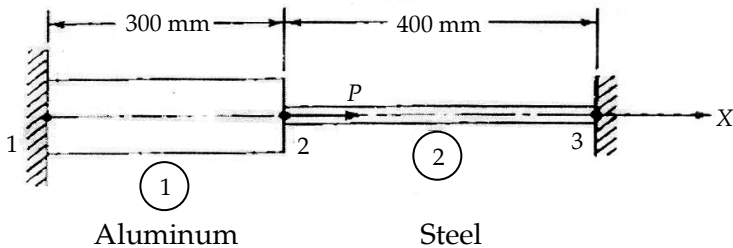
(b) What are the basic components of the NC system ? How are the NC machines classified ? 10

7. Define group technology. Explain Optiz coding system generally used in group technology. 20

### SECTION – D

8. What are the functions performed by material handling and storage system in FMS ? How to increase utilization, production rate and sizing of FMS ? Discuss with numerical concept. 20
9. What is FEM ? Explain the different steps of FEM. Consider the bar shown in fig. 1. An axial load  $P = 220 \times 10^3 \text{ N}$  is applied as shown. 20

- (a) Determine the nodal displacements.
- (b) Determine the stress in each material.



$$A_1 = 2400 \text{ mm}^2$$

$$A_2 = 600 \text{ mm}^2$$

$$E_1 = 70 \times 10^9 \text{ N/m}^2$$

$$E_2 = 200 \times 10^9 \text{ N/m}^2$$

Fig. 1