

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VI Examination May 2011****Subject code: 161903****Subject Name: Computer Aided Design****Date: 19/05/2011****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Discuss the reasons for implementing CAD. Also draw a diagram showing product cycle with the implementation of CAD. **07**
- (b)** What are different types of geometric technique available? Describe the common facilities available in a solid modeling package. **07**

- Q.2 (a)** Write Bresenham's algorithm for generation of line also indicate which raster locations would be chosen by Bresenham's algorithm when scan converting a line from screen co-ordinate (1,0) to (10,3). **07**

- (b)** Reflect the diamond shape polygon whose vertices are A(-2,0), B(0,-1), C(2,0), D(0,1) about an arbitrary line L which is represented by equations $y=0.5x+1$. **07**

OR

- (b)** A rectangle parallel piped block ABCDEFGH has position vectors **07**

$$|X| = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 3 & 0 & 1 & 1 \\ 3 & 2 & 1 & 1 \\ 0 & 2 & 1 & 1 \\ 0 & 0 & 0 & 1 \\ 3 & 0 & 0 & 1 \\ 3 & 2 & 0 & 1 \\ 0 & 2 & 0 & 1 \end{bmatrix}$$

Obtain the transformed position vectors after rotation

(i) about x axis $\theta = -90^\circ$ and then (ii) about y axis $\Phi = 90^\circ$.

- Q.3 (a)** Prepare an algorithm and write 'C' program for computer aided design of helical spring subjected to static loading. The algorithm must show clearly all the equations to be used. **07**
- (b)** Write short note on CSG and B-rep. **07**

OR

- Q.3 (a)** Explain Hermite cubic spine curve with neat sketch also write its characteristics and obtain the parametric equation for the same. **07**
- (b)** Describe the structure of an IGES file and compare IGES and PDES. **07**

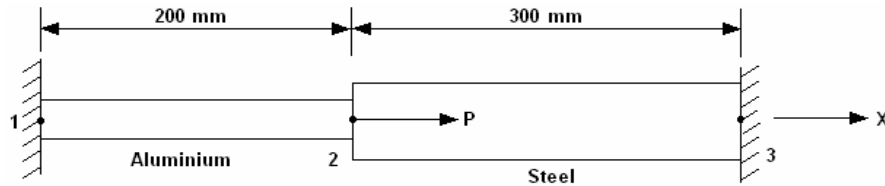
- Q.4 a)** Explain Rayleigh-Ritz and Galekin method for finding an approximate solution to the engineering problem. **07**

- (b) Write short note on automatic mesh generation with an example. 07

OR

- Q.4 (a) Explain the various steps required to solve mechanical problem using finite element analysis. 07

- (b) Axial load $P = 300 \text{ kN}$ is applied at 20°C to the rod as shown in fig. The temperature is then raised to 60°C . The coefficient of thermal expansion for Aluminium is 23×10^{-6} per $^\circ \text{C}$ and Steel is 11.7×10^{-6} per $^\circ \text{C}$. $A_{\text{Al}} = 900 \text{ mm}^2$, $A_{\text{Steel}} = 1200 \text{ mm}^2$, $E_{\text{Al}} = 70 \times 10^9 \text{ N/m}^2$, $E_{\text{Steel}} = 200 \times 10^9 \text{ N/m}^2$. Using FEM,
 (1) Determine the nodal displacement and element stresses.
 (2) The reaction forces at the supports.



- Q.5 (a) Explain following with respect to design optimization 07
 (1) Design vector
 (2) Objective function
 (3) Constraint

- (b) A manufacturing firm produces two machine parts using lathes, milling machines and grinding machines. The different machining times required for each part, the machining times available on different machines and the profit on each machine part are given in the following table. 07

Type of machine	Machining time required for the machine part (minutes)		Maximum time available per week (minutes)
	I	II	
Lathes	10	5	2500
Milling machines	4	10	2000
Grinding machines	1	1.5	450
Profit per unit	Rs. 50	Rs. 100	

Determine the number of parts I and II to be manufactured per week to maximize the profit.

OR

- Q.5 (a) Explain the Lagrange multiplier method with the help of example. 07
 (b) Find the dimensions of a cylindrical tin with top and bottom made up of sheet metal to maximize its volume such that the total surface area is equal to $A_0 = 24\pi$. 07
