C.U.SHAH UNIVERSITY
Summer Examination-2017

Subject Name : Automotive CAD

Subject Code : 4TE06ACA1   **Branch : B.Tech (Automobile)**

Semester : 6   **Date : 11/04/2017**   **Time :2:30 To5:30**   **Marks :70**

Instructions:
  (1) Use of Programmable calculator & any other electronic instrument is prohibited.
  (2) Instructions written on main answer book are strictly to be obeyed.
  (3) Draw neat diagrams and figures (if necessary) at right places.
  (4) Assume suitable data if needed.

Q-1		**Attempt the following questions:**	**14**
	a)	Define Computer Graphics.	01
	b)	Define clipping.	01
	c)	What is viewing transformation?	01
	d)	What is use of computer in Design?	01
	e)	What is mapping?	01
	f)	What are the characteristic of shape function?	01
	g)	What is Global coordinates?	01
	h)	Write Principles of virtual energy	01
	i)	Define natural Co-ordinates.	01
	j)	Give the full form of DVST.	01
	k)	Name of two CAD software.	01
	l)	Define the FEM.	01
	m)	Define the Raster scan.	01
	n)	Gibe the application of CAD software.	01

Attempt any four questions from Q-2 to Q-8

Q-2   **Attempt all questions**

  a) Explain how CAD helps to synthesize a product design and do engineering   **07**
          analysis for getting optimal design.

  b) A triangle ABC with vertices A (0, 0), B (4, 0) and C (2, 3) is to be subjected to   **07**
          following two transformation in order:
          1. Translation through 4 and 2 units along X and Y – directions respectively,
          2. Rotation through 90^0 in counterclockwise direction about the new position
             of point C.
          Determine : (i) the concatenated transformation matrix; and
                  (ii)The new position of triangle.

Q-3   **Attempt all questions**

a) What do you understand by C-rep and B-rep approaches in solid modeling? Compare them. **07**

b) Show sequence of transformation to be made to mirror any entity about the line with the equation $y = mx + b$. **07**

Q-4   **Attempt all questions**

a) Derive the equation of Hermite's cubic spline and represent in matrix form. Also write properties of this synthetic curve. **07**

b) Generate a Bezier curve using the control points: (2, 0), (4, 3), (5, 2), (4, -2), (5, -3), and (6, -2). **07**

Q-5   **Attempt all questions**

a) Prepare a C program for the design of Shaft subjected to Bending & Twisting Moment. **07**

b) Write a Breshnham's algorithm for line having slop more then 45° **07**
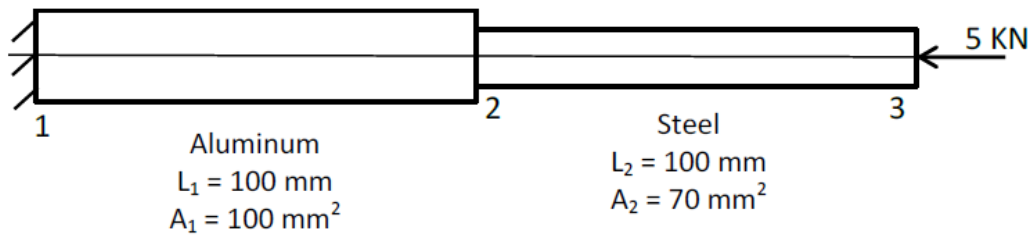
Q-6   **Attempt all questions**

a) What is design optimization? Explain its application and advantages in engineering design **07**

b) A gear manufacturing unit manufactures helical gear pairs and worm gear pairs using lathe machines, hobbing machines and profile grinding machines. The machining time required for each type of gear pair, the machining time available on different machines and the profit on each type of gear pair are given in below table. **07**

Type of machine	Machining time required for		Max. machining time available per week, minutes
	Helical gear pair, minutes	Worm gear pair, minutes	
Lathe machine	10	20	4000
Hobbing machine	25	10	5000
Profile grinding machine	06	14	2100
Profit per unit	Rs. 800	Rs. 2000	

Determine the number of helical gear pairs and worm gear pairs manufactured per week to maximize the profit.

Q-7   **Attempt all questions**

a) Explain Penalty approach and Elimination approach for FEA. **07**

b) A stepped metallic bar, made of aluminum ($E_1 = 70 \times 10^3$ N/mm^2) and steel ($E_2 = 200 \times 10^3$ N/mm^2), is subjected to the axial force of 5000 N, as shown in fig.. It is attached to rigid wall at node 1. Determine nodal displacements using finite element analysis. **07**

5 KN

1   Aluminum
L_1 = 100 mm
A_1 = 100 mm^2

2   Steel
L_2 = 100 mm
A_2 = 70 mm^2 3

Q-8   **Attempt all questions**

a) Explain the steps involved in the solution of static structural problem using finite   **04**
element method.

b) Show in fig. a truss consisting of three elements whose EA/L value is 1000 N/mm   **10**
using FEM determine the deflection at node 2 and reaction force at support.

3

1000 mm

1

1000 mm

2

100 N