Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER 2013

Subject Code: 161903 Date: 02-12-2013

Subject Name: Computer Aided Design

Time: 02:30 pm to 05:00 pm Total Marks: 70

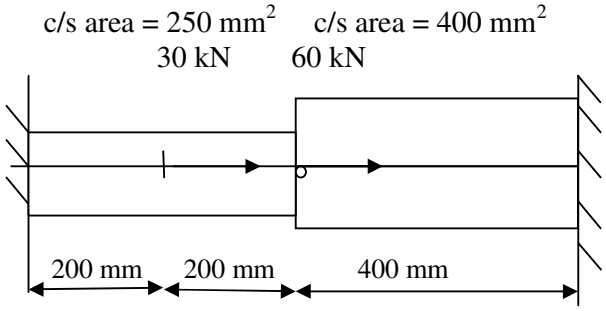
Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Use of PSG design data book is permissible.**
5. **Draw neat sketch to justify your answer where necessary.**

Q.1 **(a)** List and explain the important parameters to be considered while selecting CAD systems. List the different application of CAD in mechanical engineering. **07**

(b) Explain wireframe modeling in detail. Compare it with solid modeling. **07**

Q.2 **(a)** Figure below shows the bar with dimensions and loads. Determine the nodal displacements, element stresses and reacting if the temperature rises by 60^0C. Assume the modules of elasticity for the complete bar as 200 GPa and coefficient thermal expansion as 12 x 10 per ^{0}C. **07**



(b) Explain the concepts of FEM. Discuss the different steps involved in FEA in detailed. **07**

OR

(b) Explain 2D and 3D elements used in FEM along with their applications. **07**

Q.3 **(a)** State the different CAD software commercial available and explain the features of CAD software in detail. (any two software.) **07**

(b) Write a detailed note on B-rep and C-rep. **07**

OR

Q.3 **(a)** Explain the CAD of helical compression spring using flow chart. **07**

(b) Explain the feature based modeling with suitable examples in detail. **07**

Q.4 **(a)** Write a detailed note on Bezier curves. **07**

(b) A triangle ABC with vertices A(30,20), B(90,20) and C(30,80) is to be scaled by factor 0.5 about a point X(50,40). Determine (i) the composition matrix and (ii) the coordinates of the vertices for a scaled triangle. **07**

OR

Q.4 **(a)** 1. Explain graphics standards in brief. **03**

2. Explain the following 2D geometric transformation with suitable examples: - translation and rotation. **04**

(b) A rectangle ABCD has vertices A(1,1), B(2,1) ,C(2,3) and D(1,3) . It has to be rotated by 30^0 CCW about point P (3,2). Determine (i) the composite transformations of matrix and (ii) the new coordinates of rectangle. **07**

Q.5 **(a)** What is conventional and optimum design? Explain it with suitable examples. State the application optimization in engineering. list the optimization software **07**

(b) Derive the final preliminary design equation for helical compression for minimum weight from the following given data: **07**

Maximum load on spring = P_{max} Minimum load on spring = P_{min}
Spring Wire Cross section = circular with diameter d
Mean spring coil diameter = D
Spring material density = ρ
Modulus of rigidity = G
Wahl's stress factor = K
For spring material, maximum stress $\tau_{max} \leq [\tau]$

OR

Q.5 **(a)** Explain R.C.Johnson's optimization method with suitable examples. **07**

(b) A manufacturing unit manufactures P and Q components using A, B and C machines. The machine time required for each component, the machining time available on different machine and the profit on each types of component are given table below. **07**

Type of machine	**Machining time required for**		**Maximum machining time available per week , in minutes**
	Component P in minutes	**Component Q in minutes**	
A	10	20	4000
B	25	10	5000
C	6	14	2100
Profit per unit	Rs 800	Rs 2000	

Find the numbers of component P and Q to be manufactured per week to maximize the profit.

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