

**GUJARAT TECHNOLOGICAL UNIVERSITY****B. E. - SEMESTER – VI • EXAMINATION – WINTER 2012****Subject code: 161903****Date: 04/01/2013****Subject Name: Computer Aided Design****Time: 02.30 pm - 05.00 pm****Total Marks: 70****Instructions:**

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

- Q.1** (a) Define computer aided design. Compare computer aided design and conventional design with a neat sketch/block diagram. State the different applications of CAD in an engineering field. Justify the need of CAD in engineering area. **07**
- (b) Figure -1 shows the compound section fixed at both ends. Estimate the reaction forces at the supports and the stresses in each material when a force of 200 kN is applied at the change of cross section. **07**

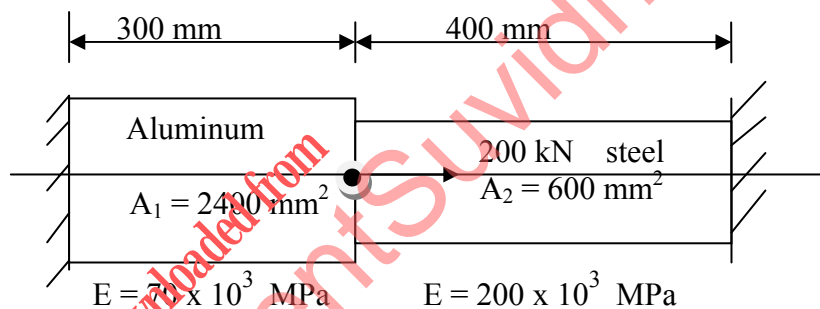


Figure -1 Q-1 (b)

- Q.2** (a) What do you mean by optimum design? Explain objectives of optimum design. Distinguish clearly between optimum design and engineering design problem solution. **07**
- (b) Derive a final preliminary design equation (final PDE) for designing a shaft of diameter 'd' for optimum power transmission considering the effect of torque gradient 'K' of the shaft, stress concentration factor 'K<sub>T</sub>' and maximum shear stress criterion of failure for shaft material. The following limitations are given for optimum power transmission capacity: **07**
- Torque gradient / stiffness, ( $K = M_T / \theta$ )      $K \geq K_{\min}$
- Diameter,  $d \leq d_{\max}$
- Length,  $L_{\min} \leq L \leq L_{\max}$
- Maximum shear stress,  $\tau \leq S_y / 2$  (FOS)
- ( Where, FOS means factor of safety)

**OR**

- (b) Formulate a final preliminary design equation (final PDE) for designing a tensile rod of circular cross-section for optimum weight considering the maximum shear stress criterion of failure for rod material from the following **07**

given data:

Force to be transmitted = F

Diameter,  $d \leq d_{\max}$

Length of rod,  $L_{\min} \leq L \leq L_{\max}$

Maximum shear stress,  $S_{s \max} \leq S_y / 2$  (FOS)

Density of material =  $\rho$

- Q.3** (a) What is a geometric transformations? Define and explain the following With respect to 2-D transformations (any three) : **07**  
(i) Translation (ii) rotation (iii) scaling (iv) reflection
- (b) Explain Bresenham's algorithm for generation of line. **07**
- OR**
- Q.3** (a) A rectangle formed by four points PQRS whose coordinates are P(50,50),Q(100,50),R(100,80),S(50,80).Find the new coordinates of the rectangle in reduced size using scaling factors  $S_x = 0.5$  and  $S_y = 0.6$  **05**
- (b) Explain 3-D geometric transformations (any three) in detail. **09**
- Q.4** (a) What is geometric modeling? Explain its importance in CAD / CAM applications. States the different types of geometric modeling in mechanical engineering field. **07**
- (b) Explain B-rep and C-rep approach of solid modeling in detail. **07**
- OR**
- Q.4** (a) Write about graphics standards. ( explanation and its uses) **07**
- Q.4** (b) Explain solid modeling in detail. **07**
- Q.5** (a) Explain 2-D and 3-D elements used in finite element analysis. **07**
- (b) Explain the Bezier curves. **07**
- OR**
- Q.5** (a) Discuss the different steps used in finite element analysis in detail. State the suitable examples of FEA in engineering. **07**
- (b) Describe a standard graphics workstation in detail along with neat sketch. **07**

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