



SF-7171

**B. E. III (Sem. VI) (Mech.) Examination**  
**May / June – 2011**  
**Computer Aided Engineering Analysis**

Time : 3 Hours]

[Total Marks :

**Instructions :**

(1)

नीचे दशांशवैक निशानीवाणी विगतो उत्तरवडी पर अवश्य लपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. 3 (Sem. 6) (Mech.)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Computer Aided Engineering Analysis"/>	<input type="text"/>
Subject Code No. : <input type="text" value="7"/> <input type="text" value="1"/> <input type="text" value="7"/> <input type="text" value="1"/>	<input type="text" value="Student's Signature"/>
Section No. (1, 2,.....): <input type="text" value="Nil"/>	

- (2) Attempt all questions from both section.
- (3) Answer to the two section must be written in one answer book.
- (4) Figure in the right indicate full marks.
- (5) Assume suitable data if necessary.

1 Define following terms : 10

- (1) Significant digits
- (2) Data error
- (3) Conversion error
- (4) Round off error
- (5) Choopping error
- (6) Transpose of matrix
- (7) Inherent error
- (8) Interactive process
- (9) Accurancy
- (10) Rank of matrix

- 2** Attempt any **two** : **20**
- (1) Using Newton - Ramphson method find roots of equation  $f(x) = x^2 - 3x + 2$ , in the vicinity of  $x = 0$ .
- (2) Using Muller's method solve the equation  $f(x) = x^3 + 2x^2 + 10x - 20 = 0$ .
- (3) Using bisection method find real roots of equation  $x^{11} = 3x^{10} + x^9 + x - 15 = 0$ .
- 3** Attempt any **two** : **20**
- (1) Using Simpson's  $\frac{3}{8}$  rule, evaluate  $f(x) = \int_1^2 (x^3 + 1) dx$
- (2) Using LU decomposition method solve the equation
- $$3x_1 + 2x_2 + x_3 = 10$$
- $$2x_1 + 3x_2 + 2x_3 = 14$$
- $$x_1 + 2x_2 + 3x_3 = 14$$
- (3) Using trapezoidal rule compute the integral  $f(x) = \int_{-1}^1 e^x dx$  for  $n = 2$  and  $n = 4$
- 4** (a) Answer the following : **8**
- (1) Discuss the different types of coordinate systems used in the finite element method of analysis.
- (2) Explain :
- (i) Initial value problem.
- (ii) Order of differential equation.
- (b) Find  $y(0.1)$  given  $y'' + 2xy' - 4y = 0$ ,  $y(0) = 0.2$ ,  $y'(0) = 0.5$ . **10**
- OR**
- (b) Find  $y(0.2)$ ,  $y(0.4)$ ,  $y(0.6)$ , using Rungekutta method **10**
- of fourth order given that  $\frac{dy}{dx} = \frac{1}{x+y}$ ,  $y(0) = 2$ .
- Hence compute  $y(0.8)$  using Adam's method.
- 5** Solve  $4_{xx} = 32u_t$ , taking  $R = 0.25$ , for  $t > 0$ ,  $0 < x < l$  and **16**
- $4(x, 0) = 0$ ,  $4(o, t) = o$ ,  $4(u, t) = t$ .

- 6 A stepped steel bar is subjected to an axial load of 300 kN as shown in figure. 1. Using finite element method compute.
- the nodal displacements
  - the stresses in each element and
  - the reaction forces at the supports. Take  $E = 200 \times 10^3 \text{ N/mm}^2$ . Use minimum number of elements.

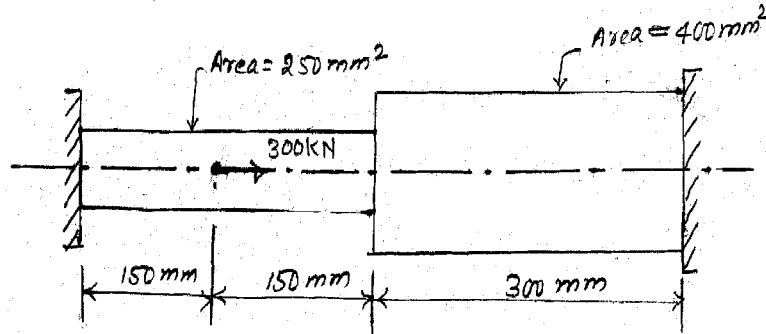


Fig. 1

OR

- 6 For a stepped bimetallic bar described in figure 1 is subjected to an axial load of 200 kN and the temperature of bar is 25°C. The temperature of bar is then raised to 50°C. The coefficients of thermal expansion for aluminium and steel are  $23 \times 10^{-6}$  and  $11.7 \times 10^{-6}$  per °C respectively. Determine
- The nodal displacements
  - The stresses in each material and
  - The reaction forces at the supports.

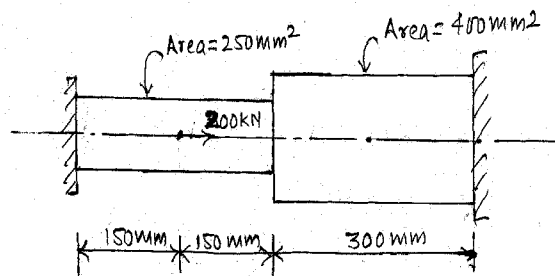


Fig. 1