Code No. 3491 / OTC

FACULTY OF ENGINEERING

B.E. 4/4 (Civil) I – Semester (OTC) Examination, December 2016

Subject : Matrix Methods and Numerical Techniques

Time : 3 hours **Max. Marks : 75**

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1 When the condition of compatibility is used in the structural analysis? 2
2 Explain convergence of iterative methods. 3
3 Draw the released structure for a fixed beam. 2
4 What is the static indeterminacy of the pin jointed plane frame shown in Fig.1? 3

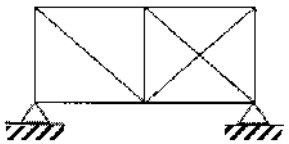

Figure 1

5 Find the degree of freedom for the pin jointed plane frame shown in Fig.1. 2
6 For the analysis of continuous beam shown in Fig.2, which method we prefer, flexibility or stiffness? Explain why? 3
7 What is a nonlinear equation? Give an example. 2
8 Write a first order ordinary differential equation and mention any two methods to solve it numerically. 3
9 Give any two examples of elliptical equations and write the equations. 3
10 Classify the following partial differential equation $u_{xx} + 2u_{xy} + u_{yy} = 0$. 2

PART – B (50 Marks)

11 Solve the following equations by Jacobi's iterative method. 10

$3x + 20y – z = -18$
$2x – 3y + 20z = 25$
$20x + y – 2z = 17$

12 Analyse the continuous beam shown in Fig.2 using force method and draw the bending moment diagram. Assume EI is same for all the spans. 10

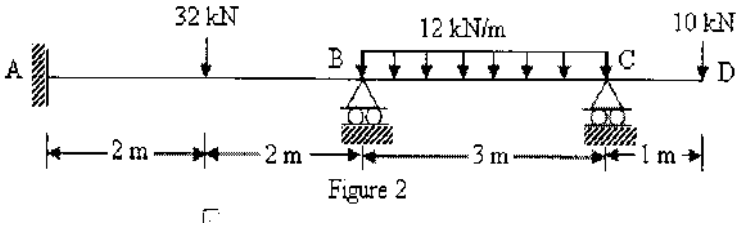

Figure 2

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13 Analyse the frame shown in Fig.3 using stiffness method and draw the bending moment diagram. 10

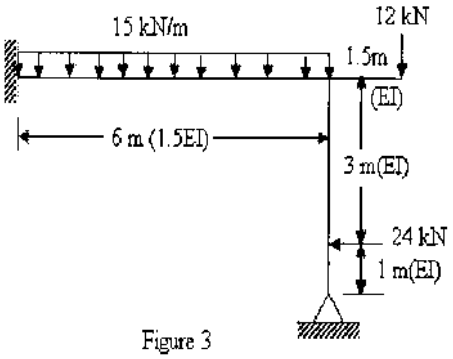

Figure 3

14 Solve the equation $x^3 - 5x + 3 = 0$ by using the bisection method. 10

15 Solve the Poisson's equation $\nabla^2 u = 8x^2 y^2$ for the square mesh shown in Fig.4 with u(x, y) = 0 on the boundary and mesh length = 1. 10

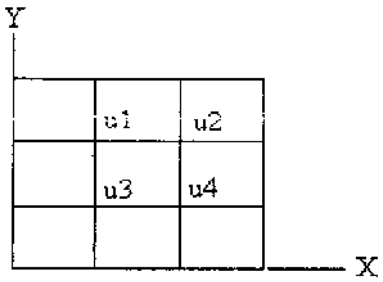

Figure 4

16 a) Use trapezoidal rule to evaluate $\int_0^1 x^3 dx$ considering five sub-intervals. 5

b) Develop the stiffness matrix for the beam shown in Fig.5. EI is uniform. 5

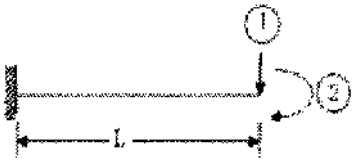

Figure 5

17 Explain the following : 10

a) Static and Kinematic indeterminacies
b) Gauss elimination method
c) Newton-Raphson method

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