**Registration No:** | | | | | | | | | | |

**Total Number of Pages: 02** **M.TECH**

**P2SUCC02**

# 2nd Semester Regular Examination 2016-17

## MATRIX METHODS OF ANALYSIS OF STRUCTURES

### BRANCH: STRUCTURAL & FOUNDATION ENGG, STRUCTURAL ENGG

**Time: 3 Hours**

**Max Marks: 100**

**Q.CODE: Z493**

**Answer Question No.1 which is compulsory and any FOUR from the rest.**

**The figures in the right hand margin indicate marks.**

**Q1** Answer the following questions: ***Short answer type*** **(2 x 10)**

**a)** Compare *static and kinematic indeterminacies* of a fixed beam and a simply supported beam.

**b)** For truss analysis, which matrix approach is preferable and why?

**c)** What is the role of degrees of freedom in determining the size of stiffness matrix?

**d)** Explain, *principle of superposition?*

**e)** Can a fixed beam be analyzed by direct stiffness method by taking two nodes and one element? Comment.

**f)** What do you mean by *equivalent nodal loads* ?

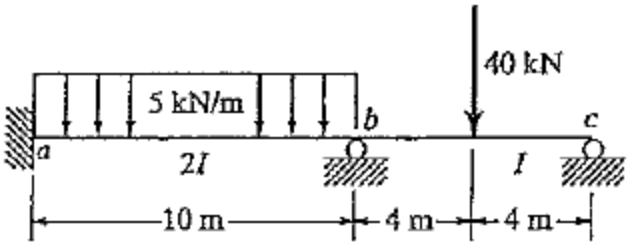
**g)** Show with the help of figures, the local and global axes of a rectangular portal with the angles of inclinations.

**h)** What is the role of a *transformation matrix* ?

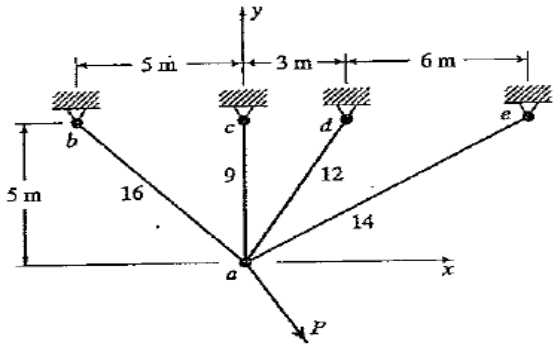
**i)** Which method of matrix analysis is suitable for computer programming and why?

**j)** Stiffness and flexibility matrices are inverse of each other. Comment.

**Q2** Solve the continuous beam shown in figure by stiffness matrix approach. EI constant for all members. **(20)**

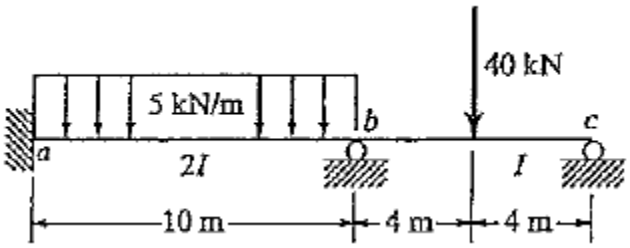



**Q3** **a)** What is the magnitude and direction of force 'P' required to obtain displacement components 2mm and -3mm along x and y directions at joint 'a'. Cross sectional areas($mm^2$ x $10^3$) are indicated on each bar. E = 200,000 MPa. **(10)**

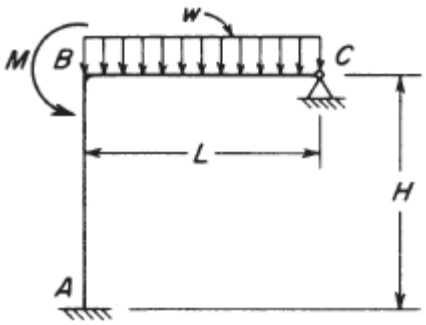



**b)** Neglecting axial stiffness, derive the stiffness matrix of a beam element from classical approach. **(10)**

**Q4** Solve the continuous beam shown in figure by flexibility matrix approach. EI constant for all members. **(20)**




**Q5** Analyze the plane frame shown in figure, considering only the flexural deformations. Assume $M = 2wL^2$, $H = L$ and both members have flexural rigidity *EI.* Use stiffness matrix approach. **(20)**




**Q6** **a)** State and prove *reciprocal theorem* in stiffness and flexibility matrix approaches. **(10)**

**b)** Assemble the stiffness matrix of the truss shown in Q. 3 (a) by using computer oriented Direct Stiffness method treating *AE* constant for all members. **(10)**

**Q7** A continuous beam ABC is fixed at end C and simply supported at ends A and B. Span AB and BC are 8m each and having constant EI. A load of 60 kN acts in the middle of AB and a load of 40 kN acts at 2m from end C on span BC. Solve the beam by flexibility method. **(20)**