Code No: **RT41018**   **R13**   **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February/March - 2018
MATRIX METHODS OF STRUCTURAL ANALYSIS
(Civil Engineering)

Time: 3 hours   **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any THREE questions from Part-B
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PART–A *(22 Marks)*

1. a) Explain the rank deficiency of a matrix.   [3]
    b) What are the characteristics of a beam element?   [3]
    c) Distinguish between the element and global stiffness matrices.   [4]
    d) What is a grid element and generate the stiffness matrix of a grid element? [4]
    e) Explain the significance of sub-structuring.   [4]
    f) Differentiate a frame element and a truss element.   [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain degrees of freedom of different types of structural elements.   [8]
    b) Explain the static and kinematic indeterminacy of various structural
        components.   [8]

3. a) Derive the stiffness matrix of a two noded truss element of length '*L*, and axial
        rigidity '*AE*'.   [8]
    b) Obtain the force-displacement equation of a beam element.   [8]

4. Using the stiffness method, analyse the beam supported and loaded as shown in
    Figure (1) Assume the flexural rigidity is constant.

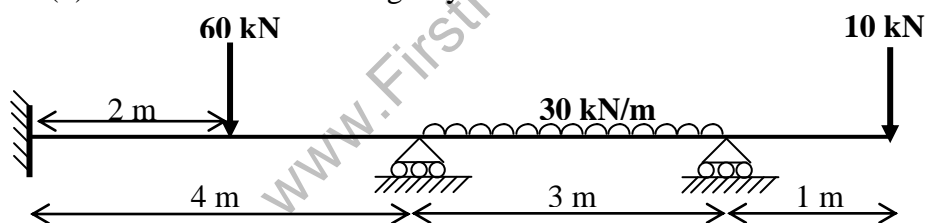Figure (1)   [16]

5. Analyse the pin jointed steel plane truss supported and loaded as shown in
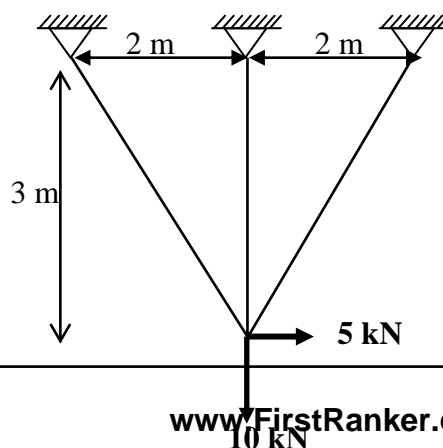   Figure (2). The cross-sectional area of each member is 1000 mm^2.

Figure (2)   [16]

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6. a) What is static condensation and explain its significance? [8]
   b) Explain the methods of handling the loads acting between the joints of various types of members in stiffness method. [8]

7. Define a stiffness coefficient and derive the stiffness matrix of a space truss element. [16]