Registration no: ☐☐☐☐☐☐☐☐☐☐☐

Total Number of Pages: 02

## 1st Semester Regular / Back Examination – 2016-17
### MATRIX METHODS OF ANALYSIS OF STRUCTURES
### BRANCH(S): STRUCTURAL & FOUNDATION ENG,STRUCTURAL ENGG
Time: 3 Hours
Max Marks: 70
Q.CODE:Y930
**Answer Question No.1 which is compulsory and any five from the rest.**
**The figures in the right hand margin indicate marks.**

Q1    Answer the following questions:                                              (2 x 10)
   a) For a two span continuous beam with one end fixed and other end hinged, find the degree of static and kinematic indeterminacy.
   b) State the principle of virtual work.
   c) Define *flexibility* and *stiffness of a member.*
   d) Sate the types of forces carried by the members of a rigid jointed plane frame.
   e) What do you mean by the two subscripts of the stiffness coefficient, $K_{ij}$ ?
   f) State the interrelationship between Stiffness and flexibility matrices of a structure.
   g) Which matrix method is suitable for analysis of statically indeterminate trusses?
   h) State *principle of superposition*.
   i) Justify, whether matrix method of structural analysis is suitable or not for manual analysis of structures.
   j) A Stiffness matrix is always symmetric. Is the statement correct? Explain.

Q2  a) Differentiate between *equilibrium* and *compatibility*.                      (5)
    b) Enumerate the basic steps in flexibility method.                             (5)

Q3  a) A continuous beam ABC is of two spans, each of 8 m span. The left hand support A is    (10)
       fixed and the middle support B and the right hand support C are on rollers. A udl of 10
       kN/m acts on the whole beam. The EI value is constant for both spans. Neglecting axial
       deformations, analyze the beam by stiffness method.

Q4     Analyze the beam by flexibility matrix method. EI = Constant.               (10)
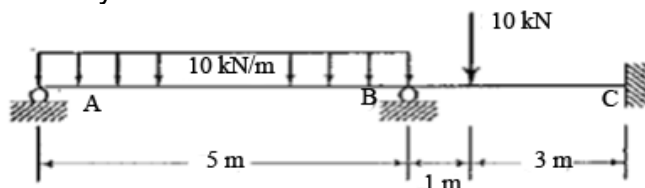
Q5  a)  For a cantilever of span, L and flexural rigidity, EI, applied with a point load, P,  (5)
        calculate the value of *flexibility* and *stiffness.*

    b)  State the conditions of equilibrium for a plane frame and and a space frame.  (5)
        State the formulae for calculating the degree of indeterminacy of these frames.

Q6  a)  Develop the stiffness matrix for the portal frame with respect to the coordinates mentioned in  (10)
        the figure.



10m, 2I

10m, 2I                5m, I
                        ) 3
                       ↙  1

                        ↓ 2
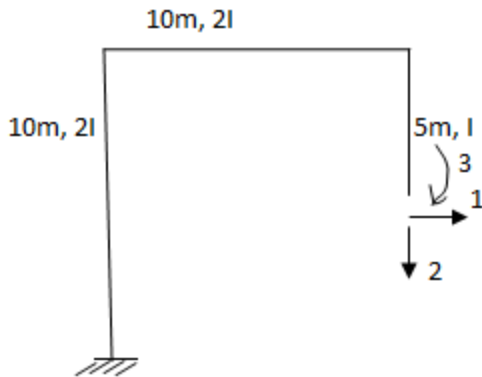
Q7      Choosing the bending moments at supports B and C as the redundants, derive the  (10)
        flexibility matrix of the continuous beam shown in figure below. EI is constant for all
        spans.
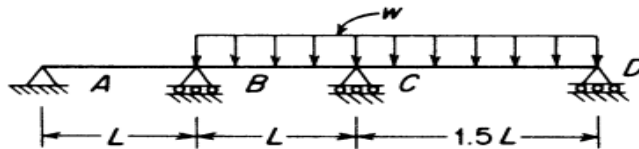


Q8      Write short notes on any **TWO** .  (5 x 2)
    a)  Reciprocal theorem
    b)  Equivalent joint loads
    c)  Kinematic Indeterminacy
    d)  Restrained structure and Released Structure