Name of the Examinations: B.E. CIVIL ENGINEERING THIRD YEAR SECOND SEMESTER - 2019

Subject : THEORY OF STRUCTURES-III   Time : Three Hours   Full Marks : 100

Part I

Instructions : Use Separate Answer scripts for each part

Q 1 a) Develop the coefficients of a stiffness matrix for a beam element.

     b) Develop the transformation matrix for a plane truss element from local to global Cartesian coordinate system.   (8 + 4)

Q2. Analyse the portal frame shown in Figure 1 for BMD and SFD using **Flexibility Matrix** approach. Calculate and show clearly the member forces and the reaction forces.   (24)

Q3. Analyse the continuous beam shown in Figure 2 using **Stiffness Matrix** approach and plot the Shear Force and Bending Moment diagrams (SFD & BMD).   (24)

L = 3 m
E = 2 x 10^8 kN/m^2
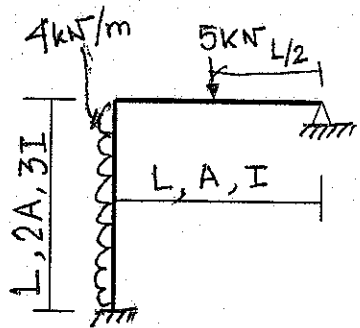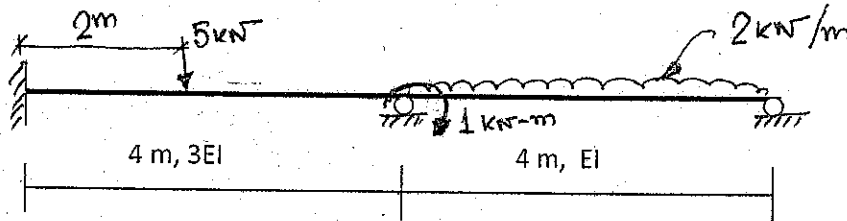A = 0.4 m x 0.4 m

Figure 1

Figure 2 (E and cross section same as Prob 2)

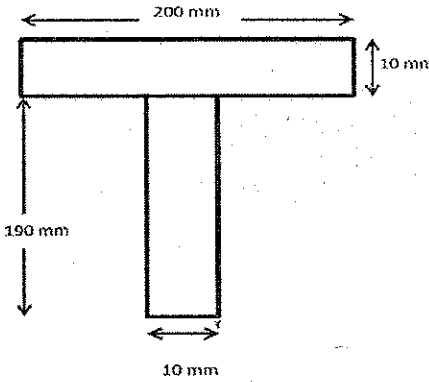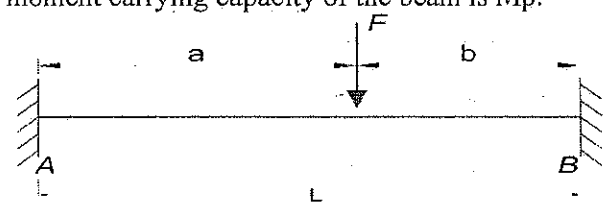# B.E. Civil Engineering - Third Year - Second Semester-19
Theory of Structures-III
PART-II

Time: Three Hours
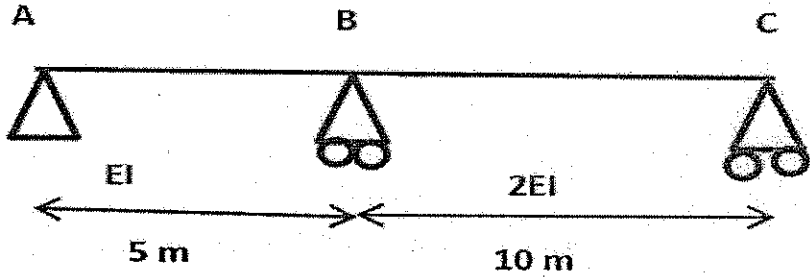
Full Marks 100
(40 marks for 2nd part)

Use a separate Answer-Script for each part
[No code or handbook is allowed]

No. of questions	Part II (answer all questions)	Marks (10+15+15)
1	A suspension bridge is of 150 m span. The cable of the bridge has a dip of 8m. The cable is stiffened by a girder with hinges at either end and at centre. The dead load of the girder is 10 kN/m. A single concentrated load of 400 kN passes through it. i) What is the value of maximum horizontal pull? ii) What will be the maximum load intensity (w) of load transmitted to the cable? iii) What will be the maximum bending moment at 12 m from left end? iv) Find the greatest positive and negative bending moment of the girder when Also find the maximum tension in the cable. **Or** Derive the influence line diagram of horizontal force on pylon, tension in the suspender, bending moment and shear force at any point on a three hinge stiffening girder of a suspension cable stayed bridge.	10
2 (a)	Find the Shape factor of the following section. 	7
2(b)	Find out the ultimate load F by upper bound theorem and lower bound theorem, if the plastic moment carrying capacity of the beam is Mp. 	8

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No. of questions	Part II (answer all questions)	Marks (10+15+15)
3	Find the maximum value of SFD at midpoint of BC of the beam ABC, if 5 kN/m UDL of length 20m load passes over ABC. The beam is made of M30 grade of concrete. I=0.0864 m⁴.	15