Reg.No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEM M. Tech. (CAAD) DEGREE END SEMESTER EXAMINATIONS
APRIL 2018

SUBJECT: FINITE ELEMENT METHODS (MME 5202)
REVISED CREDIT SYSTEM

Time: 3 Hours. Max. Marks: 50

Instructions to Candidates:
- Answer **ALL** questions.
- Missing data, if any, may be assumed appropriately.
- The use of **CERTIFIED DATA SHEET** is permitted.

1. a) Obtain the general Finite Element formulation for modal analysis of a structure. **(05)**

   b) For the spring assemblage shown in **Fig. Q.1b**, evaluate the unknown displacements using ***potential energy method***. **(05)**

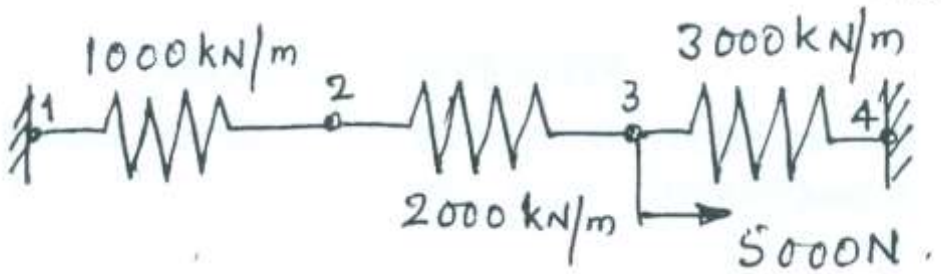

Fig. Q. 1b

2. a) Obtain the Finite Element formulation of one dimensional thermal stress problems. **(04)**

b) Evaluate the unknown displacements and element stresses for the plane truss shown in **Fig. Q. 2b.** Let E = 200 GPa and A = 4 x 10^{-4} m^2 for all the elements **(06)**

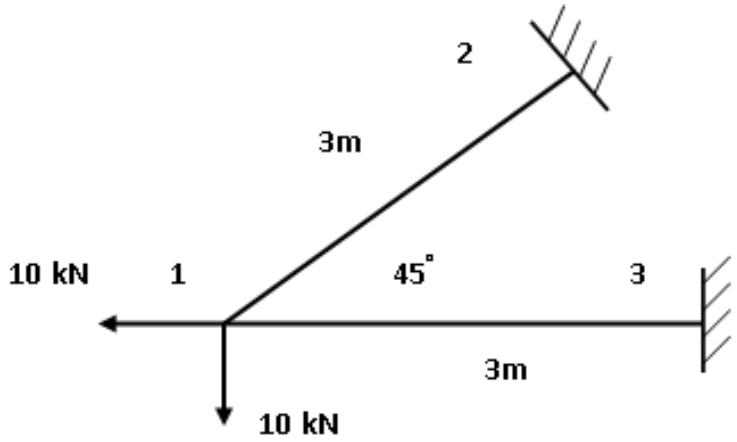

Fig. Q. 2b

3. For the plane frame shown in **Fig. Q. 3**, determine the unknown displacements and rotations of the nodes. Let E = 210 GPa, A = 10^{-2} m^2 and I = 2x10^{-4} m^4 for all the elements. **(10)**

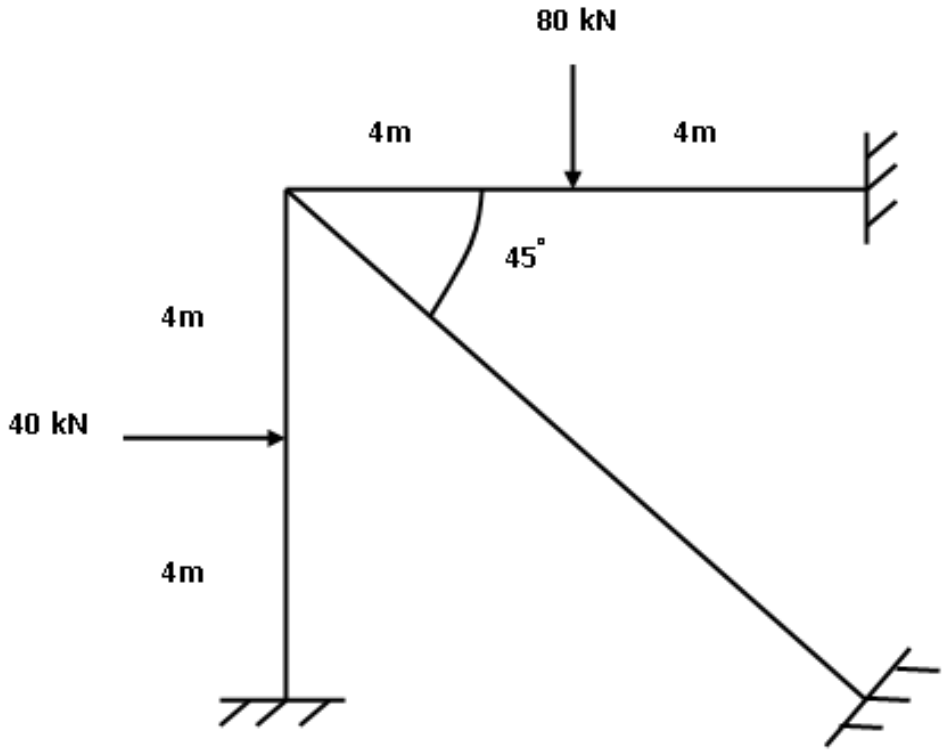

Fig. Q. 3

4. a) Obtain the expression for element stiffness matrix of 4-node tetrahedral element by using ***Isoparametric formulation method***. **(05)**

   b) Evaluate the stiffness matrix for the element shown in **Fig. Q. 4b**. The coordinates are given in units of millimeters. Assume plane stress conditions. Let E = 210 GPa, v = 0.25 and t = 10 mm. **(05)**

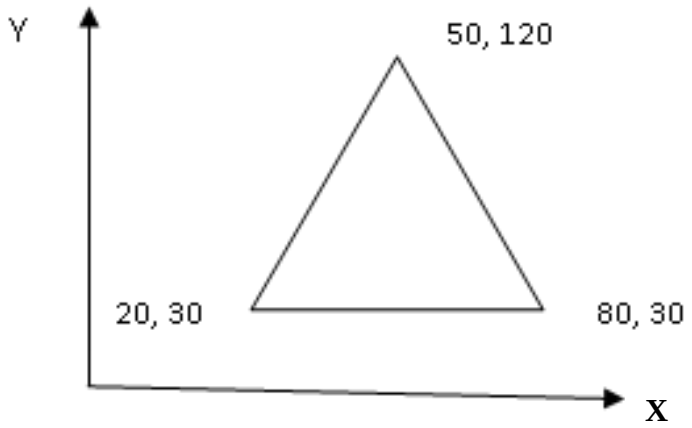

Fig. Q. 4b

5. a) Obtain the stiffness matrix of an arbitrarily oriented beam element in XY plane. **(05)**

   b) For the beam shown in **Fig. Q. 5b**, evaluate the unknown displacements and rotations. Let E = 210 GPa, I = 4×10^{-4} m^4 **(05)**

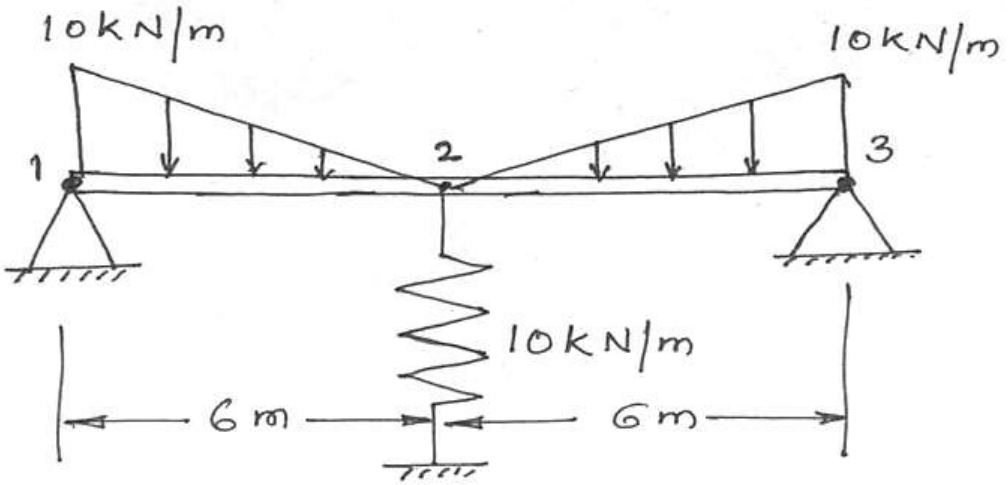

Fig. Q. 5b