

# DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

## MINOR I :CVL756 ADVANCED STRUCTURAL ANALYSIS (2018-19)

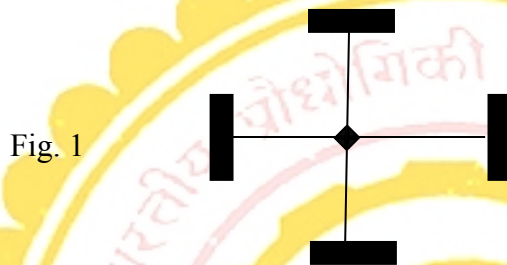
**Time allowed:** 1hour (4:00-5:00 PM)  
**Venue:** LH 510

**Date:** 26 August 2018  
**Max marks :** 20

**NOTE:** (a) All questions are compulsory. (b) Draw neat and clear sketches wherever required.  
(c) Assume suitable data if necessary. (d) Assume members as extensible unless otherwise stated.  
(e) All answers must be supported by calculations/ justification to secure assigned marks.

**Q1.** What will be the degree of kinematic indeterminacy of the four member rigid frame structure shown in Fig.1 if the members are (a) Inextensible (b) Extensible

**(3 marks)**



**Q2.** For the structure shown in Fig. 2, perform following operations:

- (a) Label the degrees of freedom including those associated with reactions
- (b) Obtain the force vector
- (c) Express  $K_{23}$  (of total structural stiffness matrix) in terms of the elements of member stiffness matrices of contributing members

**(2+4+3= 9 marks)**

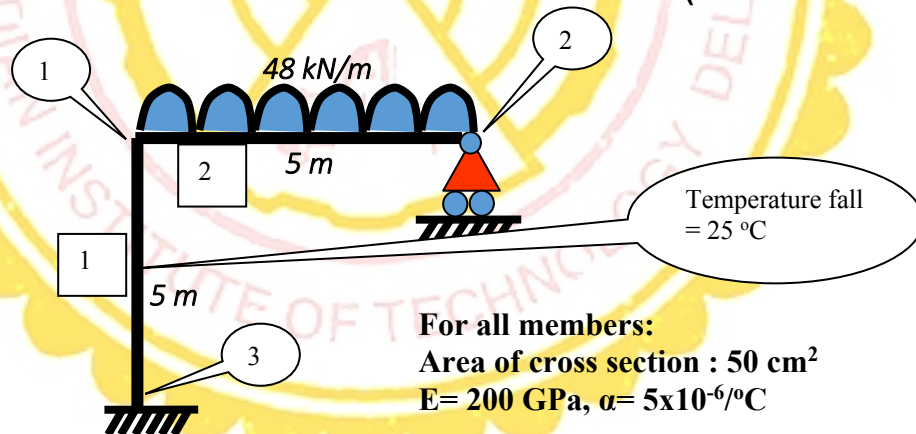


Fig. 2

**Q3** For the structural member shown in Fig. 3, derive  $K_{33}$  and  $K_{22}$ . Both segments of the member have same length "L" but different EI values as indicated in the figure.

**(4+4= 8 marks)**



Fig. 3