DEPARTMENT OF CIVIL ENGINEERING, IIT DELHI

MAJOR : CVL 756 ADVANCED STRUCTURAL ANALYSIS (2020-21)

Time allowed: 90 mins (12:15pm-1:45pm) **Date:** 12 Jan 2021
Venue: Online **Max marks :** 40

NOTE: (a) All questions are compulsory. (b) Draw neat and clear sketches wherever required. (c) Assume suitable data if necessary. (d) Assume members as INEXTENSIBLE unless otherwise stated. (e) All answers must be supported by calculations/ justification to secure assigned marks. (f) This question paper has two printed pages (g) BEGIN ANSWER TO A QUESTION ON A FRESH PAGE

Q1. The inclined frame structure shown in Fig. 1 has a plastic moment capacity of 300 kNm for all members. For this structure:

(a) Draw clearly the beam-column and the combined mechanisms.
(b) Determine the failure load for the beam-column mechanism involving column DE.
(c) Perform yield check at joint B and draw inference based on result.

(**3+10+5 = 18 marks**)

Q2. Derive expression for curvature of a plate along any general direction defined by unit vector **n** at an orientation α with respect to the xy coordinate system.

(**6 marks**)

Q3. Determine the rotation at point B for the beam structure shown in Fig. 2 using matrix flexibility method. Assume all members to have same value of EI.

(6 marks)

Q4. For the structure shown in Fig. 3, express the element (15, 15) of K_{TS} in terms of the elements of the member stiffness matrices of contributing members with full reasoning. Numbers in circles are joint numbers and those in rectangle are element numbers. Members are extensible.

(10 marks)

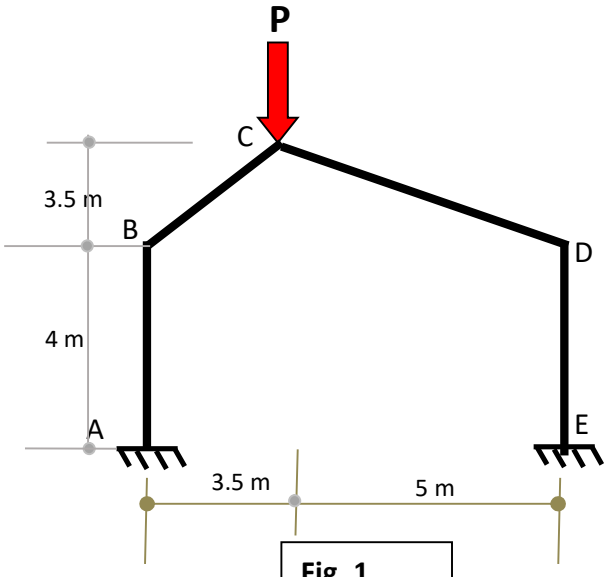

Fig. 1

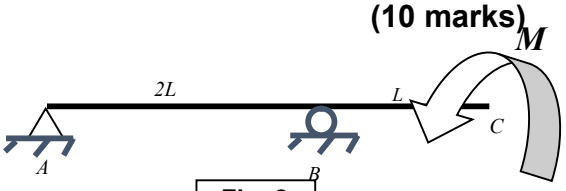

Fig. 2

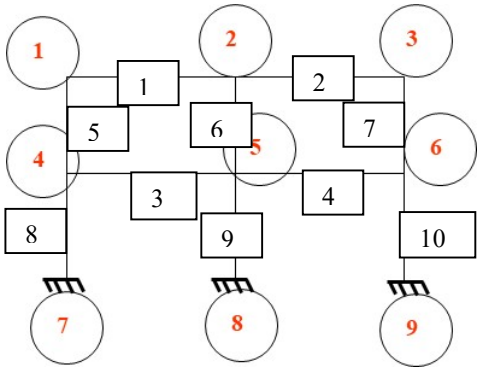

Fig. 3