Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
(ONLINE)
SEMESTER II
SESSION 2019/2020

COURSE NAME	:	ADVANCED STRUCTURE ANALYSIS
COURSE CODE	:	BFS40103
PROGRAMME CODE	:	BFF
EXAMINATION DATE	:	JULY 2020
DURATION	:	6 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

Q1 (a) The application of indeterminate structure is more practical in construction. Give **TWO (2)** reasons for this.

(4 marks)

(b) The frame in **Figure Q1(a)** tend to sway to the right due to the horizontal load, P. With the help of sketches, give three (3) possible solutions to provide stability to the frame.

(6 marks)

(b) An indeterminate frame in **Figure Q1(b)** is subjected to a distributed load of 10 kN/m along span of member AB and a point load of 10 kN at the mid-span of member BC. Values of EI is constant. Using force method and taking reaction at D in x-direction as redundant:

(i) Draw the deflection envelope of the frame.

(2 marks)

(ii) Determine the reactions at the supports of the frame

(10 marks)

(iii) Draw the shear force and bending moment diagram of the frame.

(3 marks)

Q2 (a) Briefly discuss **TWO (2)** assumptions in yield line analysis.

(5 marks)

(b) A two-way rectangular slab has two potential mode of failure as shown in **Figure Q2(b)(i)** and **Figure Q2(b)(ii)**. Given $q = 20$ kN/m^2 and negative moment is similar to positive moment, which is m.

(i) Determine the internal and external work for both potential mode of failure.

(16 marks)

(ii) Determine which is the critical failure mode between the two failure mode for a load q and capacities as shown in the figures.

(4 marks)

Q3 A two member truss system is loaded with 20 kN point load at point C as shown in **Figure Q3**. The length of AC is similar to the length of BC. The height of the truss is 8 m. EA is constant for each member. By using Direct Stiffness Method,

(a) Determine the stiffness, k, for member AC and member BC.

(6 marks)

(b) Determine the global stiffness matrix for the truss system.

(6 marks)

(c) Calculate the deflection in x and y direction at point C.

(5 marks)

(d) Calculate the reaction forces at support A and B.

(8 marks)

Q4. A two-bay frame as shown in **Figure Q4** is loaded with point load of 20 kN at point B and at mid-span of member BC. A distributed load of 10 kN/m is acting along member CD. The frame is fixed supported at A and F, and pinned supported at E. Using conservation of work method;

(a) Draw all the collapse mechanisms of the frame.

(6 marks)

(b) By using virtual work method, determine the maximum plastic moment, M_p, of the frame for all mechanism.

(16 marks)

(c) Determine the critical M_p.

(3 marks)

– END OF QUESTIONS –

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2019/2020 PROGRAMME CODE : 4 BFF

COURSE NAME : ADVANCED STRUCTURAL ANALYSIS COURSE CODE : BFS40103

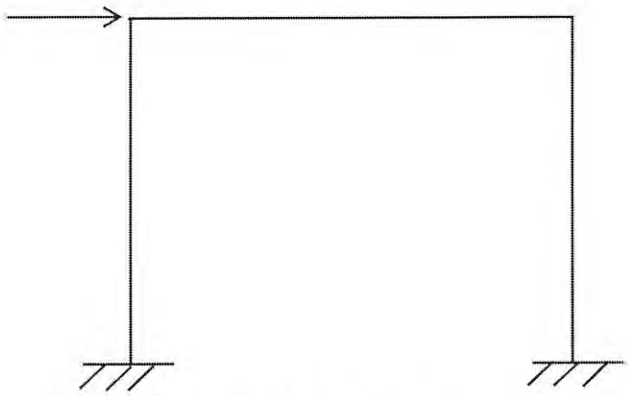

FIGURE Q1(a)

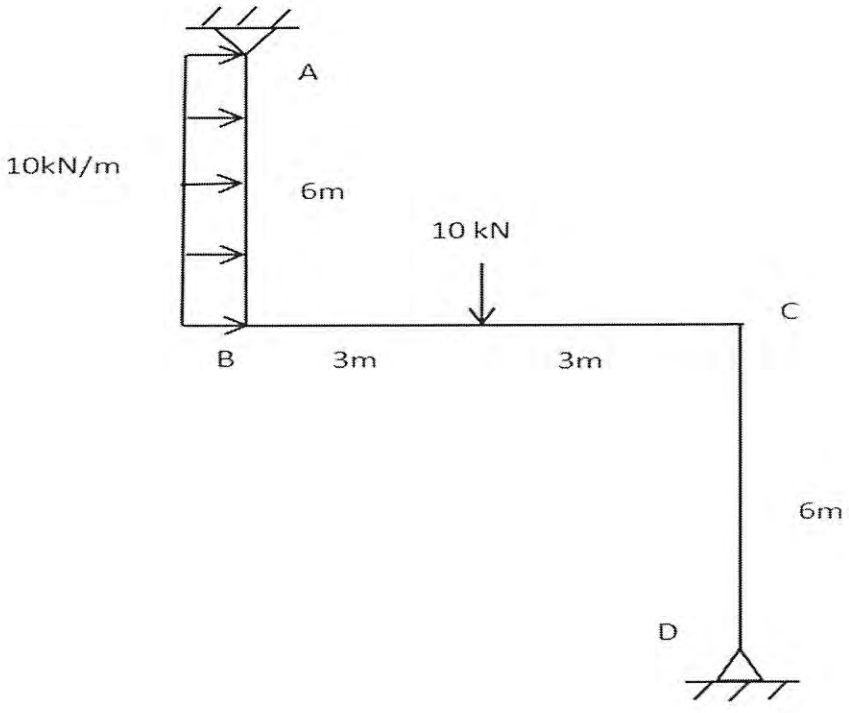

FIGURE Q1(b)

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2019/2020 PROGRAMME CODE : 4 BFF

COURSE NAME : ADVANCED STRUCTURAL ANALYSIS COURSE CODE : BFS40103

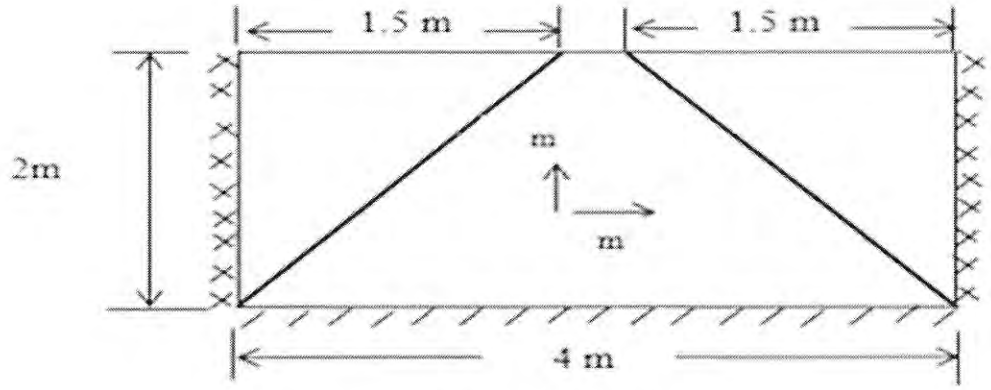

FIGURE Q2(b)(i)

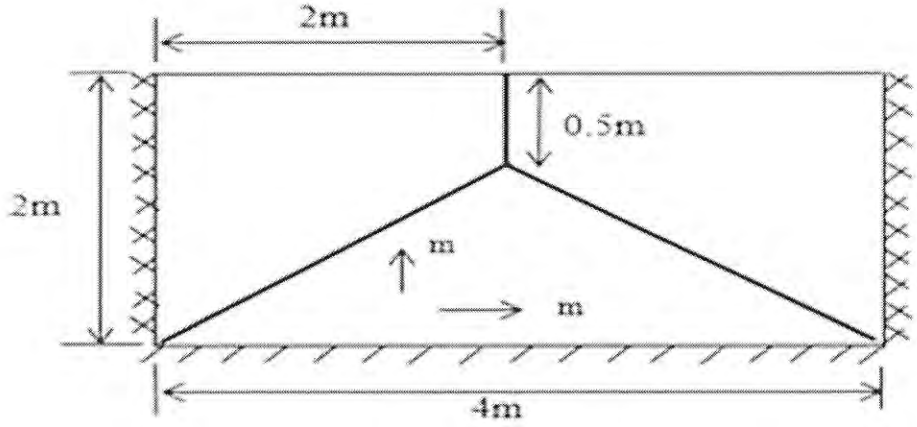

FIGURE Q2(b)(ii)

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2019/2020 PROGRAMME CODE : 4 BFF

COURSE NAME : ADVANCED STRUCTURAL ANALYSIS COURSE CODE : BFS40103

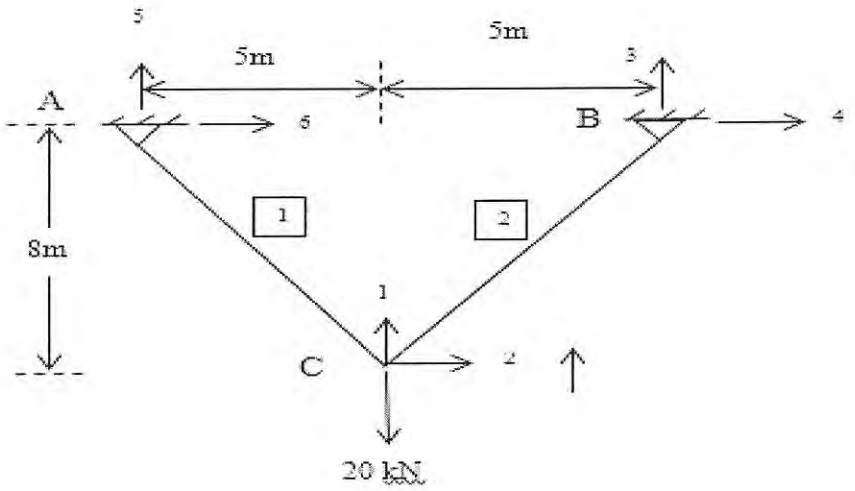

FIGURE Q3

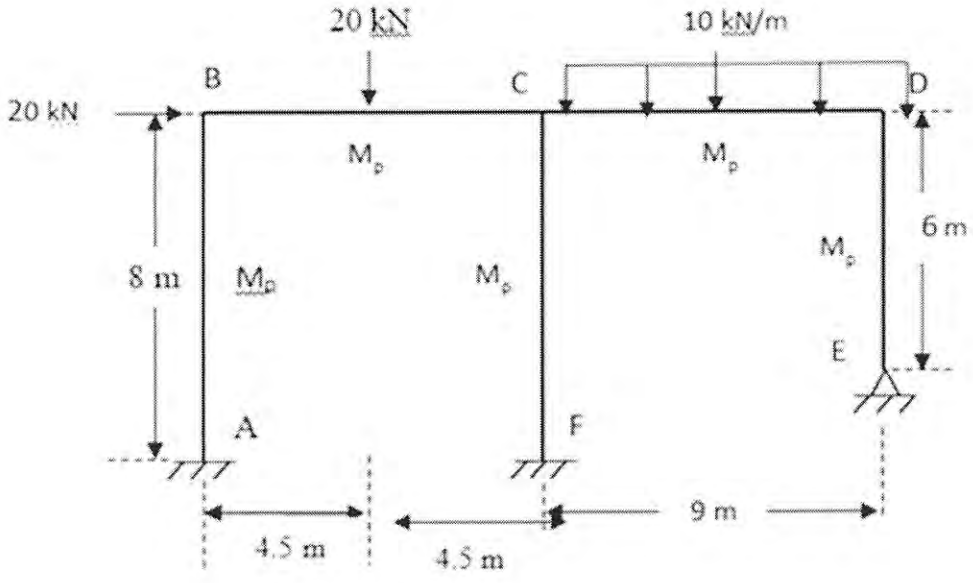

FIGURE Q4

FINAL EXAMINATION

SEMESTER/SESSION : SEM II / 2019/2020 PROGRAMME CODE : 4 BFF

COURSE NAME : ADVANCED STRUCTURAL ANALYSIS COURSE CODE : BFS40103

FORMULA

$$k = \frac{EA}{L}\begin{bmatrix} \lambda_x{}^2 & \lambda_x\lambda_y & -\lambda_x{}^2 & -\lambda_x\lambda_y \\ \lambda_x\lambda_y & \lambda_y{}^2 & -\lambda_x\lambda_y & -\lambda_y{}^2 \\ -\lambda_x{}^2 & -\lambda_x\lambda_y & \lambda_x{}^2 & \lambda_x\lambda_y \\ -\lambda_x\lambda_y & -\lambda_y{}^2 & \lambda_x\lambda_y & \lambda_y{}^2 \end{bmatrix}$$