MACHAKOS UNIVERSITY

University Examinations for 2021/2022

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

SECOND YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

ECV 209: THEORY OF STRUCTURES II

DATE: **TIME:**

INSTRUCTIONS

- *This paper comprises of FIVE questions. Answer **THREE** questions*
- *Question one is **compulsory** and carry 30 marks*
- *Answer any other **TWO** questions*

QUESTION ONE (COMPULSORY)(30MKS)

a) A three-hinged arch is subjected to two concentrated loads as shown in figure 1. Determine the support reactions of the arch (7mks)

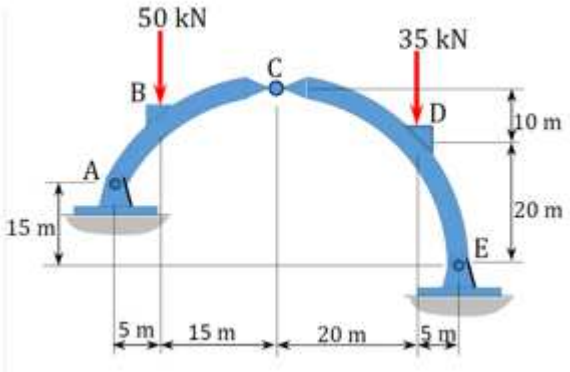

Figure 1

b) Construct the influence lines for vertical reaction at A and B of the beam shown in figure 2 (5 marks)

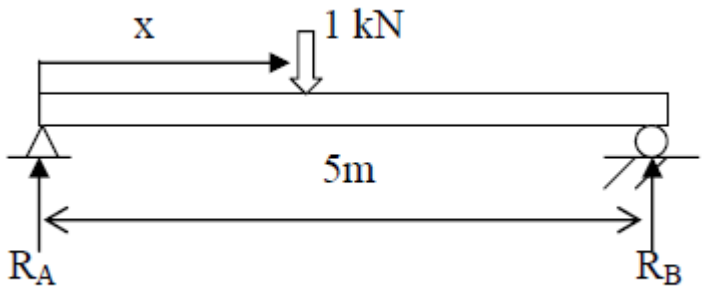

Figure 2

c) Determine the maximum deflection in a simply supported beam of length L carrying a concentrated load P at midspan (8 marks)

d) Analyze the uniform continuous beam shown in figure 3 using the method of consistent deformations. Also, draw the bending moment diagram. (7 marks)

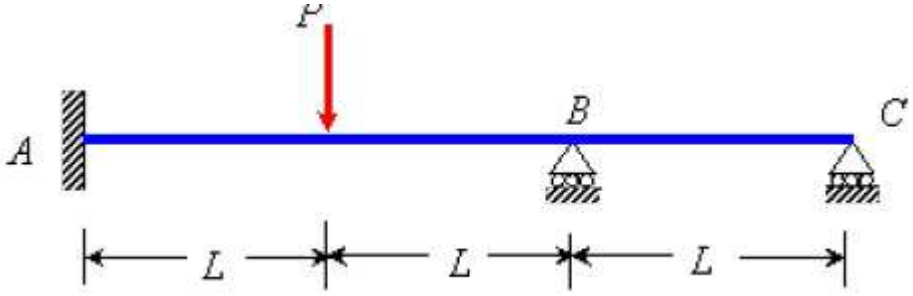

Figure 3

e) State three types of arches (3 marks)

QUESTION TWO (20 MARKS)

a) Analyze the continuous beam shown in figure 4 using the three moment equation. Draw shear force and bending moment diagram. (10 marks)

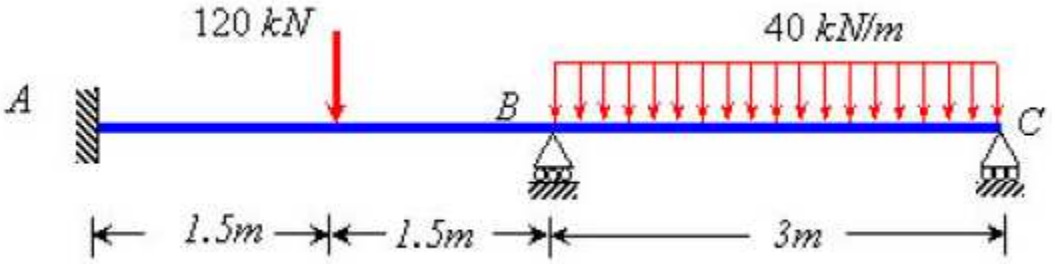

Figure 4

b) Analyze the continuous beam shown in figure 5 using the three moment equation. Draw the shear force and bending moment diagram. (10 marks)

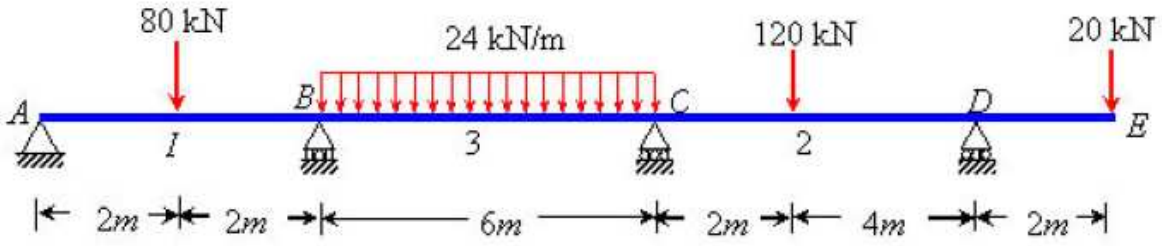

Figure 5

QUESTION THREE (20 MARKS)

A beam of length 6m is simply supported at its ends and carries two point loads of 48 kN and 40 kN at a distance of 1m and 3m respectively from the left support. Find

(i) Deflection under each load

(ii) The point to which maximum deflection occurs. E= $2*10^5$ N/mm^2 and I=$85*10^6$ mm^4

QUESTION FOUR (20 MARKS)

Determine the maximum deflection for the beam shown in figure 6 by the moment-area method.

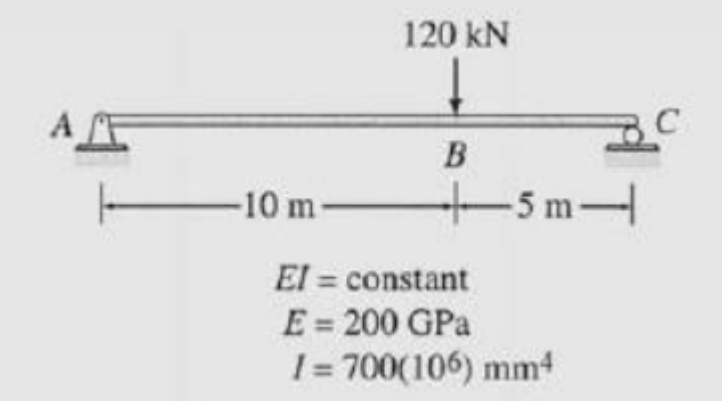

Figure 6

QUESTION FIVE (20 MARKS)

A parabolic arch with supports at the same level is subjected to the combined loading shown in figure 6. Determine the support reactions and the normal thrust and radial shear at a point just to the left of the 150 kN concentrated load.

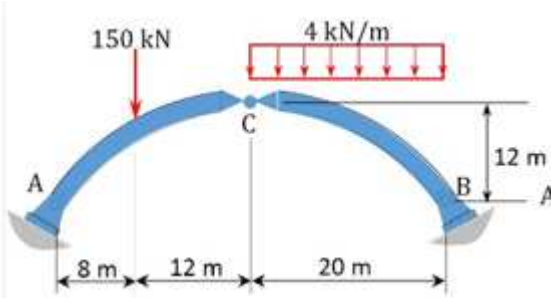

Figure 7