(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY SPECIAL/SUPPLEMENTARY EXAMINATIONS 2019/2020 ACADEMIC YEAR

FIRTH YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN CIVIL AND STRUCTURAL ENGINEERING

COURSE CODE: CSE 516E

COURSE TITLE: DESIGN OF BRIDGES

DATE: THURSDAY, 28TH JANUARY 2021 TIME: 11.00AM – 1.00PM

INSTRUCTIONS:

1. Answer ALL Questions in SECTION A and any ONE question SECTION B
2. Examination duration is **2 Hours**

MMUST observes ZERO tolerance to examination cheating

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SECTION A

Question 1 (25 marks)

a) With aid of sketches describe four types of bridges (8 Marks)
b) Discuss factors that may influence conceptual choice of bridge type (6 marks)
c) What is preventive maintenance of bridges? (2 marks)
d) Distinguish between bridge Scheduled and response maintenance activities (3 marks).
e) Outline three common deficiencies in steel bridges and their rehabilitation measures (6marks)

Question 2 (25marks)

a) Discuss how the following preliminaryinformation is essential in planning of a new bridge (13 marks).
    i. Topographic
    ii. Geologic
    iii. Geotechnical
b) Determine the following critical moments for 8 m wide bridge deck slab with a span of 33m.
    i. The maximum design bending moment per metre width due to HA loading for the bridge deck. (6 marks).
    ii. The maximum design bending moment per metre width for the bridge due to 30 units of type HB loading (6 marks).

Question 3 (25 marks)

a) Discuss the importance of the following in bridge site selection(5 marks)
    i. River condition
    ii. Slope and bank condition
b) Analysis of a three span bridgegirder shown in figure **Q2-(a)** using the influence line method gave the bending moment influence diagrams in figure **Q2-(b) Q2-(c)** and **Q2-(d)** for critical moments at Points A,B and C respectively as shown on the figure. Using the given influence line diagrams.
    i. Determine the critical bending moment due HA loading. (10marks)
    ii. Determine the critical sagging bending moment due 45 units of HB loading. (10 marks)

SECTION B

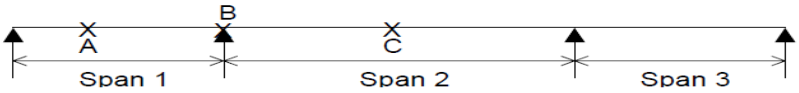
Question 4 (25 marks)

Design a simply supported reinforced concrete bridge deck slab using a unit strip method. The depth of the deck is 600mm and carries a 125mm depth of surfacing, together with a nominal HA live load udl of 18kN/m^2 and knife edge load of 30kN/m. The span of the deck is 10.0m centre to centre of bearings.

Question 5 (25 marks)

Design a simply supported steel beam for a bridge which carries a 150mm thick concrete slab together with a nominal live load of 10.0 kN/m^2. The span of the beam is 7.5m centre to centre of bearings and the beams are spaced at 2.99 m intervals. The slab will be assumed to be laid on top of the beams with no positive connection to the compression flange.

Figure Q2-(a)



Point A – maximum sagging moment in span 1
Point B – maximum hogging moment over pier 1
Point C – maximum sagging moment in span 2

Span 1= 10m, span 2= 25m, span 3= 10m

Figure Q2-(b)

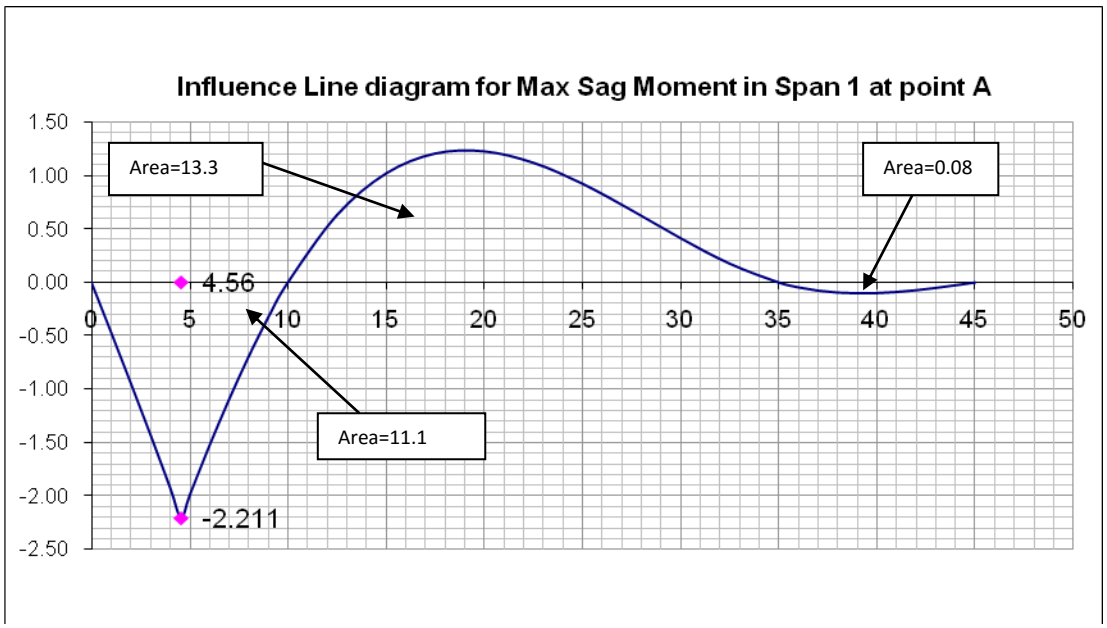


Figure Q2-(c)

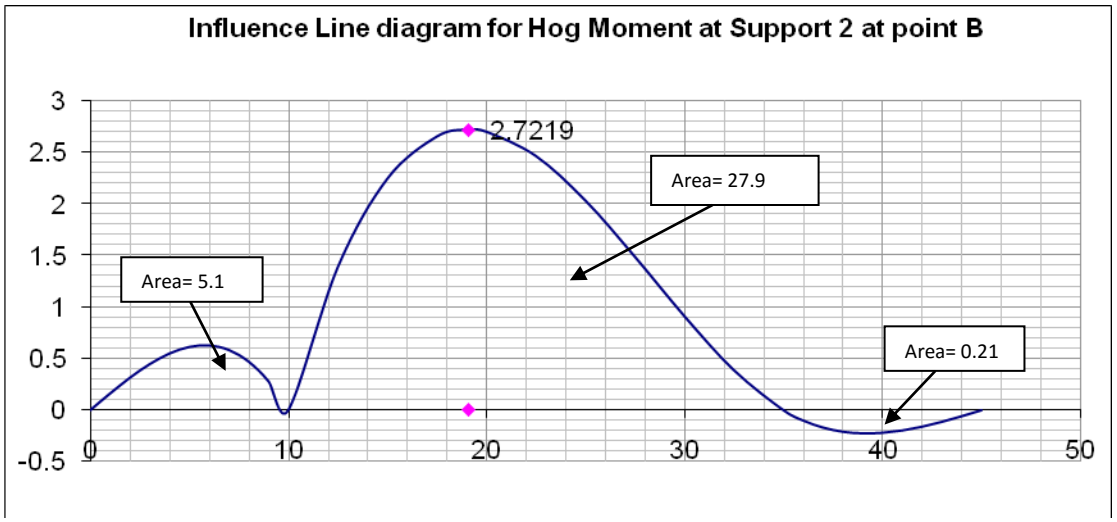
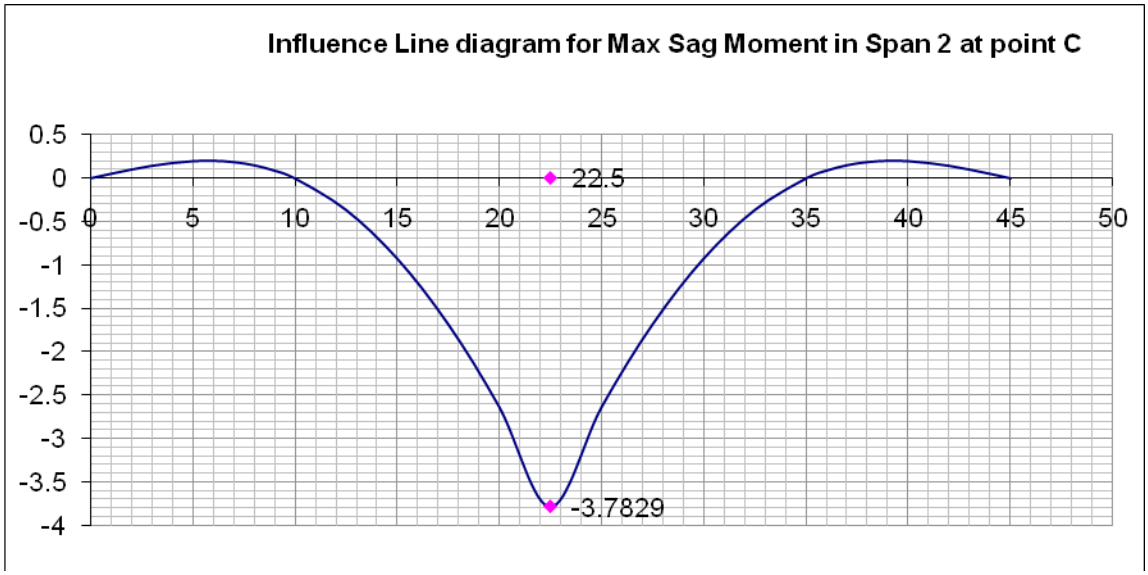


Figure Q2-(d)


Influence Line diagram for Max Sag Moment in Span 2 at point C
0.5
0
-0.5
-1
-1.5
-2
-2.5
-3
-3.5
-4
0
5
10
15
20
25
30
35
40
45
50
22.5
-3.7829