(12)

B. Sc. Engg. (CEE)/5th Semester — 3rd October 2023/Afternoon

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Mid-term Examination — **Winter Semester: 2022–2023**
Course Number: CEE 4513 — **Full Marks: 100**
Course Title: Structural Analysis and Design I — **Time: 1.5 Hours**

There are **4 (four)** questions. Answer **all of them.** The symbols have their usual meanings. Marks of each question and corresponding CO and PO are written in brackets. Assume any reasonable value if required.

1. Determine the static determinacy of the truss shown in ***Fig. 1***, find the stresses in member ***BC***, ***JC***, and ***JG*** if the cross-sectional areas of all members are 10 in². CO1, PO1: [15]

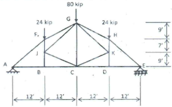

Fig. 1 for Question No. 1

Or

Determine the support reactions of the tied three hinged arch of ***Fig. 2***. Also, calculate the tension in the rod ***AD.*** Assume that AB and BC portions are pin connected at B. CO1, PO1: [15]

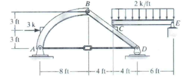

Fig. 2 for Question No. 1

2. (a) Draw the influence line for the shear in panel ***CD*** and bending moment at ***E*** for the girder with the floor system shown in ***Fig. 3.*** Assume that the load moves from A to F. CO2, PO2: [15]

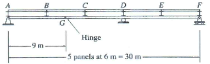

Fig. 3 for Question No. 2 (a)

(b) Draw the influence lines for the beam shown in ***Fig. 4*** for the following items: CO2, PO2: [10]
(i) vertical reactions at supports B, D, and G
(ii) moment at support G

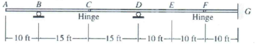

Fig. 4 for Question No. 2 (b)

(c) Draw the influence lines for the moment at support *A*, and vertical reaction at support ***B*** of the frame shown in ***Fig. 5***. CO2, PO2: [20]

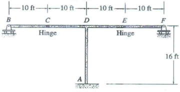

Fig. 5 for Question No. 2 (c)

3. **(a)** State and derive the general cable theorem. CO3, PO2: [10]

   (b) A cable has a span of 500 ft and a sag ratio of 1/40. The slope of the cable chord is defined by tan γ =0.7. The load on the cable is 1 kip/horizontal ft. Find (a) the slope of the cable at 400 ft from the left support, (b) maximum tension in the cable, and (c) the length of the loaded cable. CO3, PO2: [15]

4. Due to the axle loading shown in ***Fig. 6***, calculate the maximum moment at the quarter point of a ***simply supported beam*** with a span of ***80 ft***. CO2, PO2: [15]

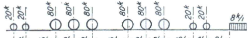

Fig. 6 for Question No. 4

Or

Due to the axle loading shown in ***Fig. 7***, calculate the maximum shear at a point 30 ft. from the left end of a ***simply supported beam*** with a span of ***80 ft***. CO2, PO2: [15]

Fig. 7 for Question No. 4