ELIZADE UNIVERSITY

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

B.Eng (Civil and Environmental Engrg.) Degree 1st Semester Examination 2020/2021 Session

CVE 405: Structural Analysis I Units: 3 Time Allowed: 3Hrs

INSTRUCTION: Answer Four Questions. Each carries 25 marks

HOD'S SIGNATURE

Section A

The plane frame shown in Figure 1 below is pin-jointed throughout. All members are of the same material and have a constant ratio of length to area of cross section.

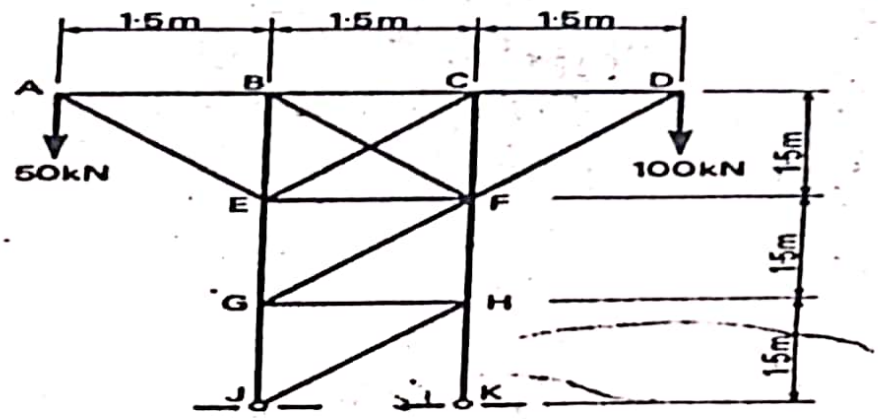

Figure 1

Question 1

Taking member BF as redundant, calculate force in each member in Fig 1 as a result of the external load only.

Question 2

Determine the deflection of member BF and calculate the overall total forces in each member.

Section B

Question 3

Figure 2 shows a continuous beam having constant E, but with variable span inertia. The basic inertia unit I – $20x10^{-6}$ m^4. Support C settles by an amount 0.008m, Determine the deflected profile and construct the bending moment diagram inserting principal values.

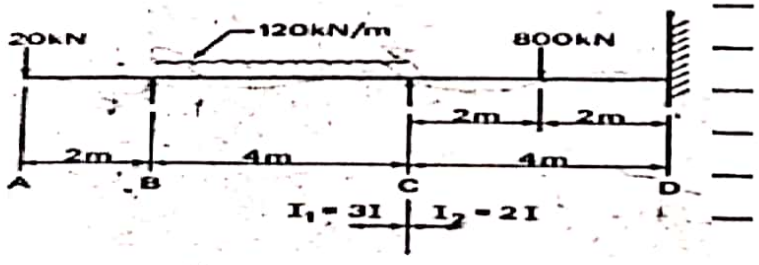

Figure 2

Question 4

A uniform beam ABCDE shown in Fig 3 is continuous over three spans AB=BC=6m, CD=4.5m and DE = 1.5m. The beam carries a uniformly distributed load of 30kN/m run on span AB, 60kN/m run on span BC and a single concentrated load of 120kN midway between C and D a concentrated load of 60kN at E. A is fixed in position and direction and all supports are initially at the same level, but under the given load support c sinks 12mm. The I of the beam is $120x10^6mm^4$ and E can be taken as $200kN/mm^2$. Determine the beading moments at A, B, C and D.

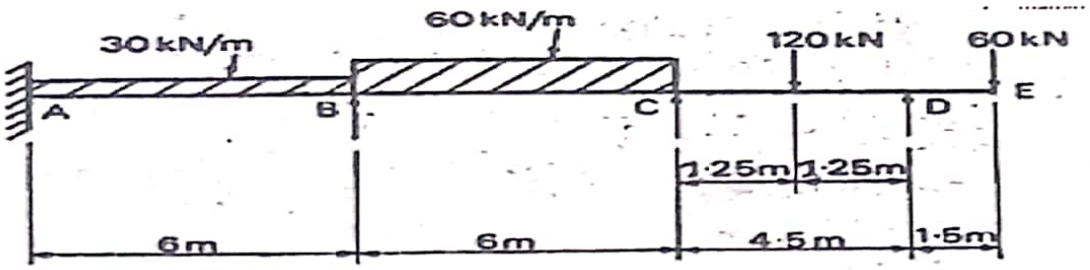

Figure 3

Question 5

a. What are the two types of grading system? How important is grading stamp to engineer? **(4 marks)**

b. The following observations were made in a Southwell test, carried out by a structural engineering student, of a pin-jointed steel tubular strut of length 1.76m.

Load (kN)	0.2	2.22	4.45	6.67	8.90	9.78	10.69	11.12	11.54	11.94
Cantral Def.	-	0.25	2.75	4.75	6.75	8.25	10.25	14.00	14.75	22.50
Load (kN)	12.37									
Central def.	75.00									

Central def. = Central deflection from initial position

Estimate from these observations the critical load of the strut and deduce its flexural rigidity EI.

(21 marks)

Question 6

A horizontal beam ABCD, 400mm deep is continuous over three spans each of 4m as shown in Figure 4. The end supports A and D are rigidly fixed and all supports are at the same level. The I of the section is uniform at 200 $x10^6$ mm^4 and the modulus of elasticity E = $200kN/mm^2$.

I. If a load of 30kN/m is uniformly distributed over two spans AB and BC, determine the maximum bending stress in the continuous member.

II. What will be the maximum additional bending stress caused at B by a settlement of support B by 6mm.

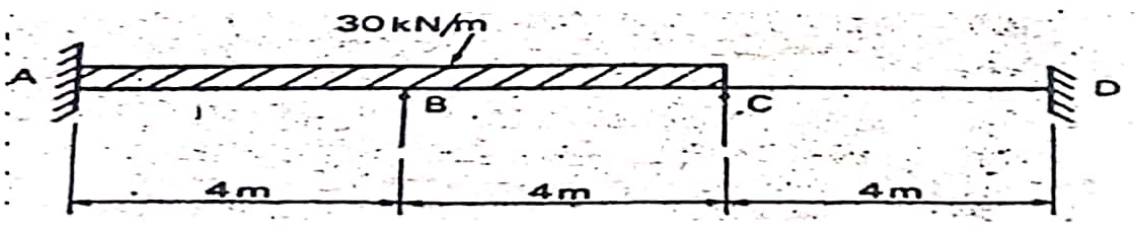

Figure 4