Reg No.:_____   Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (S, FE) / S2 (PT) (S, FE) Examination May 2023 (2015 Scheme)

Course Code: CE202
Course Name: STRUCTURAL ANALYSIS – I (CE)

Max. Marks: 100   Duration: 3 Hours

Answer any two full questions from each part. Assume any missing data suitably.

PART A
Answer any two full questions, each carries 15 marks.   Marks

1 a) Illustrate the situation in which method of sections are preferred over method of joints? **(6)** Explain the step by step procedure for finding out the member forces in a perfect truss by method of sections.

   b) Determine the vertical deflection at the free end of the cantilever frame shown in figure **(9)** using strain energy method. Take $E = 200kN/mm^2$ and $I = 30 \times 10^7 mm^4$
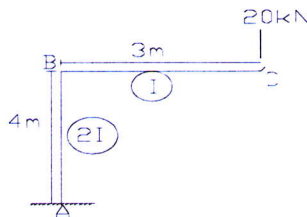
2 a) State and prove Betti's theorem   **(5)**

   b) Using unit load method, find the vertical deflection at L1 of the loaded truss shown in **(10)** figure. The cross sectional areas of the members in cm^2 are marked along with the members. Take $E = 2.0 \times 10^5 N/mm^2$.
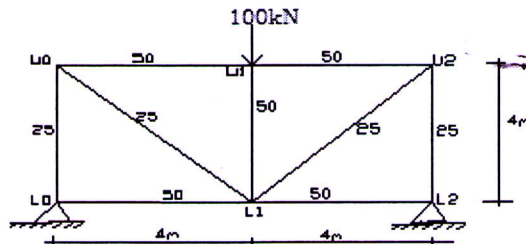

3 a) State and prove Catigliano's theorem for deflection   **(6)**

   b) Determine the vertical deflection at the free end D of the overhanging beam shown in **(9)** the following figure by using unit load method. Take $E = 2 \times 10^5 N/mm^2$ and $I = 1 \times 10^7 mm^4$.
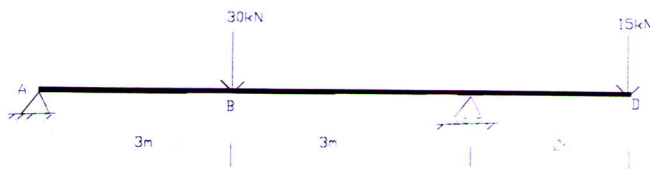
PART B
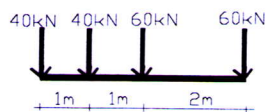### *Answer any two full questions, each carries 15 marks.*

4 a) Find the reactions in the beam shown in figure using consistent deformation method.   (15)
The segment AB has uniform I values and segment BC has uniform 2I values.
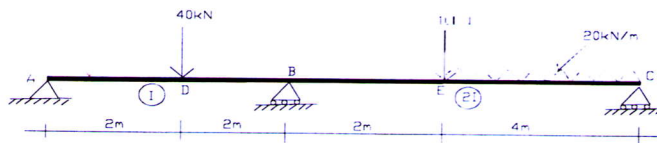
5 a) A two hinged rectangular portal frame ABCD of uniform flexural rigidity is shown in   (15)
figure. Find the horizontal thrust and draw the BMD. Use strain energy method.
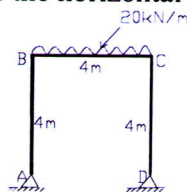
6 a) The following system of concentrated loads rolls from left to right on a girder of span   (15)
16m with 60kN load leading. Determine the absolute maximum moment, the maximum
moment and maximum shear force at 4m from the left support.

PART C
Answer any two full questions, each carries 20 marks.

7 a) State and explain Eddy's theorem in arches.   (6)

b) A cable of span 100m has its ends at heights 8m and 15m above the lowest point of the   (14)
cable. It carries a uniformly distributed load of 10kN/m per unit horizontal run of the .

span. Determine the horizontal and vertical reactions at the supports. What is the length of the cable?

8   a)   Prove that an arch is more economical than a simply supported beam having same span   (7)
             and same load by quoting one example.

       b)   A three hinged arch of span 16m has its abutments A and B is shown in figure.   (13)
             Determine the horizontal thrust and vertical reactions at the hinged supports A and B.
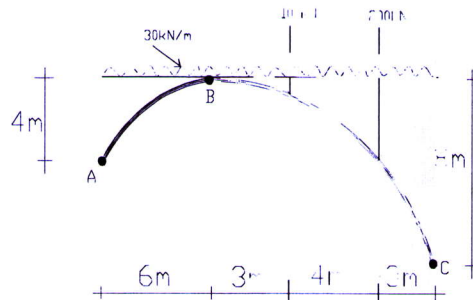
9   a)   **Explain** with neat figure the main components of suspension bridges. Also show the   (8)
             load distribution in suspension bridges with a neat figure.

       b)   **A three hinged** circular arch of span 40m carries a concentrated load of 120kN at a   (12)
             horizontal distance of 10m from the left end. Find the reactions at the supports
             maximum positive and negative bending moment.

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