Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fourth Semester B.Tech Degree (S,FE) Examination August 2021 (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) Write the steps in the analysis of determinate truss by the 'method of sections', indicating the conditions for selection of section. 5

b) Analyse the truss shown in Fig.1 and tabulate the member forces. 10

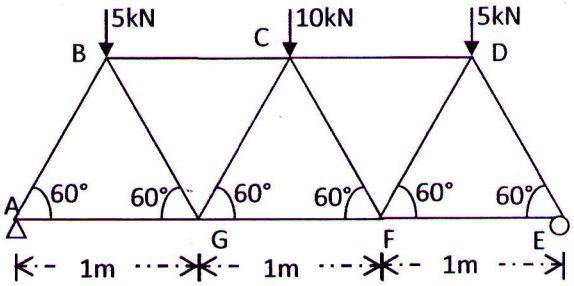

Fig.1

2 a) A cantilever beam of span 2meters carries a vertical concentrated load of 8kN at the free end. Calculate the strain energy due to axial force, bending moment and shear force in the beam. Cross section is 200mm x 400mm, Young's modulus, E = 200GPa. Poisson's ratio, υ= 0.3. Also calculate the deflection at the free end using work done- strain energy relation. 12

b) Explain the effects of temperature change and lack of fit in a statically determinate truss. 3

3 a) Determine the horizontal deflection at B by unit load method. Given E= 200GPa. Cross section of the members is circular with 150mm diameter. 9

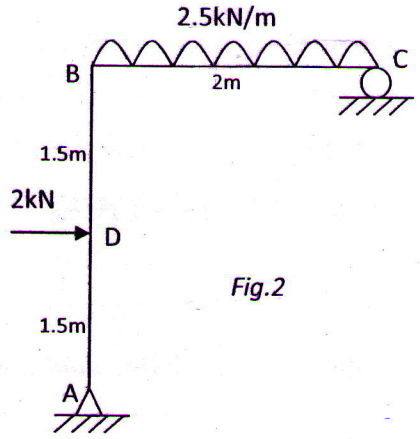

Fig.2

b) Determine the static indeterminacy and kinematic indeterminacy of the structures shown in Fig.3. 6

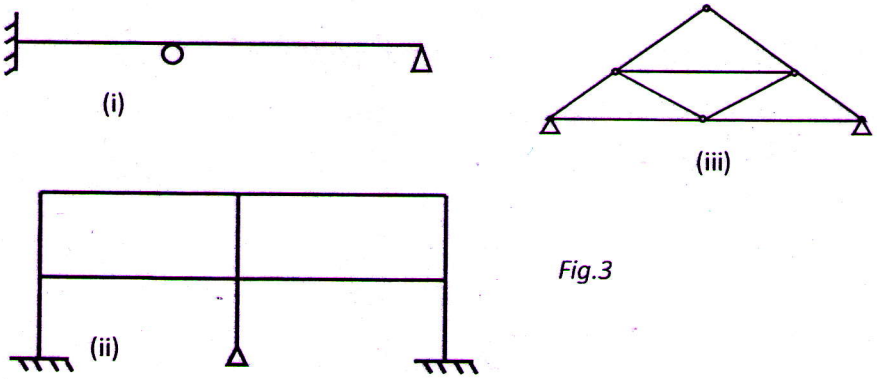

Fig.3

PART B

Answer any two full questions, each carries 15 marks.

4 a) Analyse the truss in Fig.4 and tabulate the member forces. Axial rigidity of all members can be assumed as AE. 13

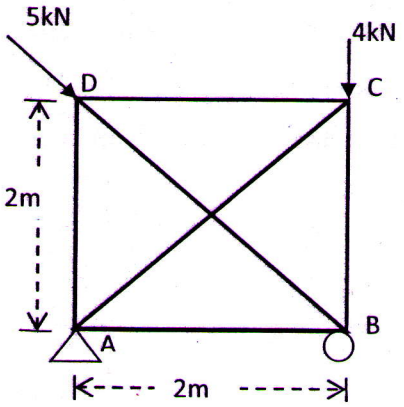

Fig.4

b) Explain how the method of consistent deformation can be applied to determine the reaction at the prop in a propped cantilever. 2

5 a) A live load of 45kN/m, 7m long crosses a simply supported girder of span 10m. Find the maximum bending moment that can occur at a section 3m from left end. 7.5

b) A girder is loaded as shown in Fig.5. Find the shear force at section C using influence line diagram. 7.5

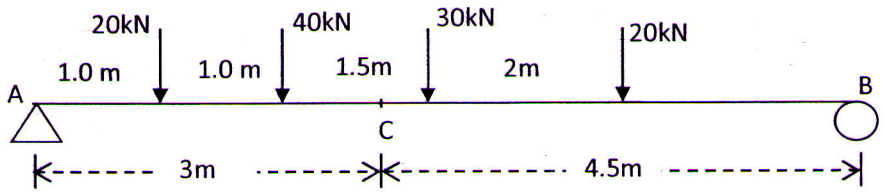

Fig.5

6 a) Analyse the beam shown in Fig.6 by the method of consistent deformation and draw SFD and BMD. 7.5

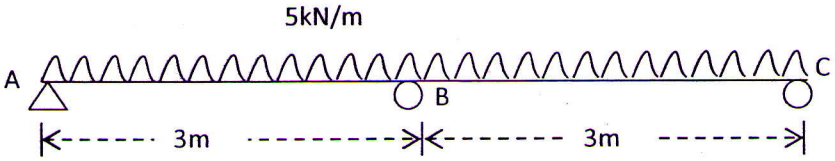

Fig.6

b) A uniformly distributed load of *w/* unit length and length '*a*' is supported on a simply supported girder of length L. Calculate the absolute maximum bending moment in the girder and specify the position of the UDL for the same. Given *a* <L. 7.5

PART C

Answer any two full questions, each carries 20 marks.

7 a) A light cable is carrying a uniformly distributed load of *w* per unit run on the horizontal span. Its ends are supported at points which are at the same level and are ℓ distance apart. If *h* is the dip, show that the profile of the cable is parabolic. 7

b) A cable of span 50meter is supporting four concentrated loads 30kN, 40kN, 10kN and 15kN respectively at points C, D, E, and F which are 10m, 20m 30m and 40m from left support. Right support B is 5m higher than the left support A. Dip of point D is 7m.Calculate the support reactions and the tensions in the various parts of the cable. 13

8 a) A three-hinged parabolic arch has a span of 15m and a rise of 3m. It carries a uniformly distributed load of 15kN per meter over the left half of the span and a point load of 100kN at 3m from the right end. Find the bending moment, normal thrust and radial shear at a section 3m from the left end. 12

b) Draw the influence line diagram for horizontal thrust in a three- hinged parabolic arch of span L and rise h. 8

9 a) A cable of span 150 meter and dip 12m carries a load of 5kN per meter run of horizontal span. Find 10

i) the maximum tension in the cable and the inclination of the cable at the support.

ii) the forces transmitted to the supporting pier if the cable is clamped to a saddle with smooth rollers resting on the top of the pier. Anchor cable is inclined at 30° to the horizontal.

b) A semi-circular arch and a parabolic arch are having the same span and they support a uniformly distributed load of w per unit run over the whole span. Find the horizontal thrust and support reactions for these 3- hinged arches. Radius of the semi-circular arch is R and the rise of parabolic arch is $1/4^{th}$ of its span. 10

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