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S.E. (Civil) (Sem-IV) (Revised Course 2016-2017)
 EXAMINATION Nov/Dec 2019
 Structural Analysis - I

[Duration : Three Hours]

[Total Marks : 100]

Instructions:

- 1) Answer any TWO questions each, from Part A and Part B and any ONE from Part C.
- 2) Draw neat sketches wherever necessary
- 3) Assume suitable data if required

Part A

- 1 a) What is indicated if a structure is statically indeterminate? Determine the static and kinematic indeterminacy for each of the following: 10

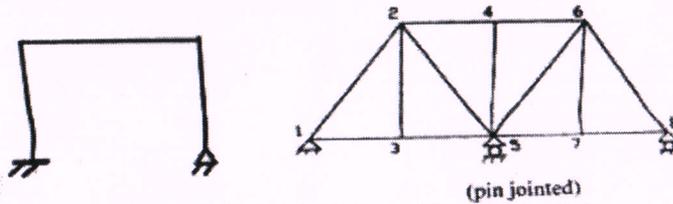


Fig Q 1 (a)

- b) A fixed beam AB of constant section and 7 m span is loaded as shown in fig below. Determine end moments, and support reactions. Sketch the SF and Net BMD 10

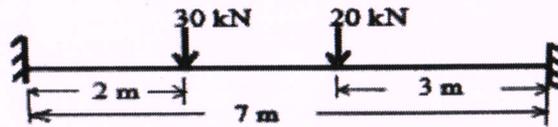


Fig Q. 1(b)

- 2.2 a) Continuous beam of uniform section ABCD is supported and loaded as shown in fig. below. Determine the reactions at supports and end moments draw SFD and net BMD. 10

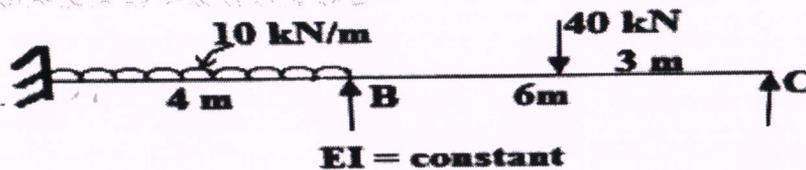


Fig. Q 2 (a)

- b) Determine the support reactions and end moments of the fixed beam as show in figure. The beam carries a uniformly distributed load, w over the left half span. Use Moment area method. 10

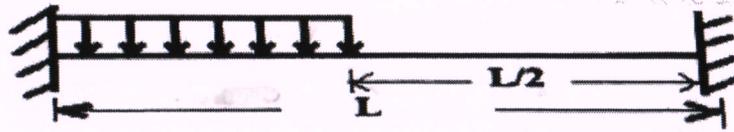


Fig Q. 2 (a)

Q.3

- a) Find the horizontal and vertical deflection of joint A of the truss shown in Figure below. $E=2 \times 10^5 \text{ N/mm}^2$. Take CSA of each member as 600 mm^2 .

10

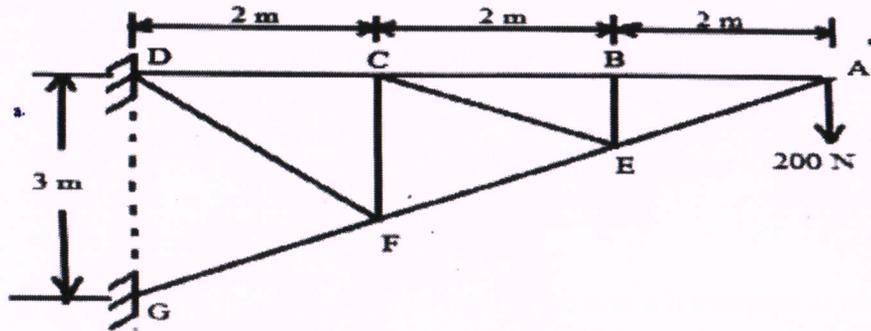


Fig Q 3(a)

- b) Determine the vertical and horizontal component of deflection at A for the frame shown in the figure. Use strain energy method.

10

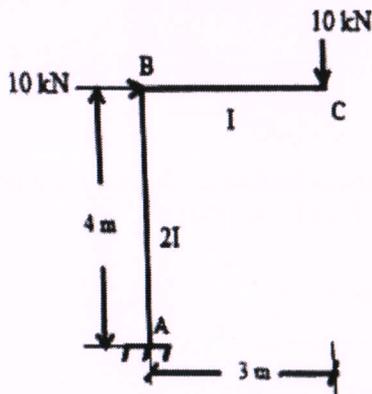


Fig Q.3(b)

PART B

Q.4

- a) A train of wheel loads as shown in fig below crosses a girder of span 25 m with 120 kN load leading. Draw influence lines for and determine the values of -
 i) Maximum positive and negative shear force at a section 8 m from the left end of the span
 ii) absolute maximum bending moment of the girder.

15

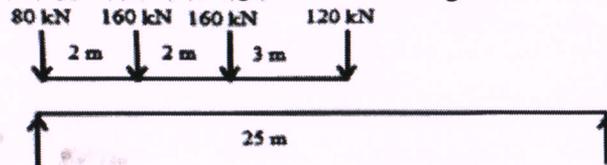


Fig. Q 4(a)

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- b) A propped cantilever of span L carries a uniformly distributed load of w per meter run over the whole span. Find the prop reaction by principle of least work.

Q.5 A three-hinged stiffening girder of a suspension bridge of span 100 m is subjected to point loads of 200 kN and 300 kN at the distance of 25m and 50 m from the left end. Find the shear force and the bending moment for the girder at a distance 30 m from the left end. The supporting cable has a central dip of 10 m. find also the maximum tension in the cable and slope of the cable. **20**

Q.6 A three-hinged arch of span 60 m is supported at different levels as shown in the figure. Find the bending moment in the arch at a distance of 16 m from the left hand support. Draw BMD **20**

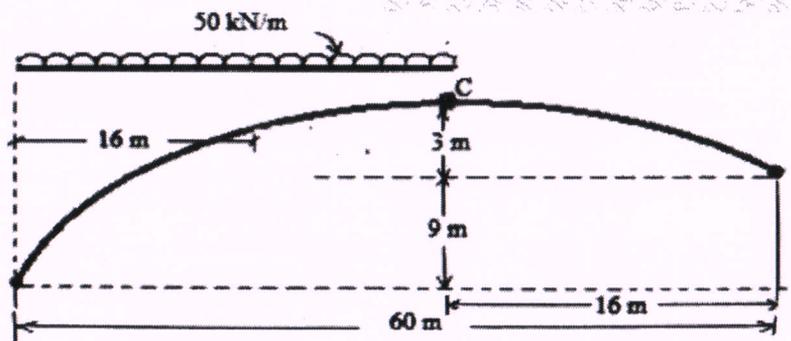


Fig.Q 6

PART C

Q.7 a) Analyse the two span continuous beam shown in figure below, if support B settles by 5 mm. take $E=15 \text{ kN/mm}^2$, I is constant throughout and is equal to $5 \times 10^9 \text{ mm}^4$ **10**

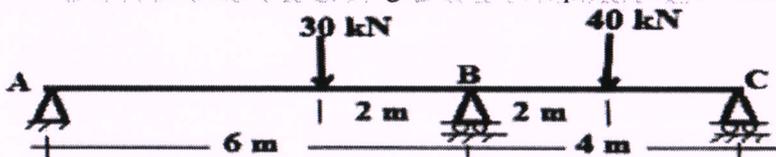


Fig Q.7

b) Two point loads of 100 kN and 200 kN spaced 3m apart cross a girder of span 15m from left to right with the 100 kN load leading. Draw the influence line for shear force and bending moment and find the value of- **10**
 i) maximum shear force and the bending moment at section, 6m from the left hand support. Also
 ii) find the absolute maximum moment due to the given load system.

Q.8 a) A 25 kN load is applied gradually on a steel rod ABC as shown in figure. Taking, $E=200 \text{ GPa}$, determine the strain energy stored in the entire rod. If the yield strength of the material is $\sigma_y=320 \text{ MPa}$, find the maximum energy that can be absorbed by the rod without undergoing permanent deformation. **10**

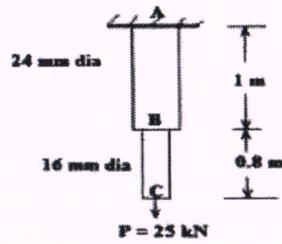


Fig Q 8 (a)

- b) A cable of span 100 m and rise of 10 m is carrying a load of 20 kN/m calculate change in horizontal tension when the temperature rises through 10°F . take $\alpha = 6 \times 10^{-6}$ per $^\circ\text{F}$.

10