**Registration No :** | | | | | | | | | | |

**Total Number of Pages : 03** **B.Tech.**
**PCI4I001**

**4th Semester Regular / Back Examination 2017-18**
**STRUCTURAL ANALYSIS - I**
**BRANCH : CIVIL**
**Time : 3 Hours**
**Max Marks : 100**
**Q.CODE : C891**

**Answer Part-A which is compulsory and any four from Part-B.**
**The figures in the right hand margin indicate marks.**
**Answer all parts of a question at a place.**

**Part – A (Answer all the questions)**

**Q1** **Answer the following questions: *multiple type or dash fill up type :*** **(2 x 10)**

**a)** The number of independent equations to be satisfied for static equilibrium in a space structure is :
i) 2 ii) 3
iii) 4 iv) 6

**b)** Castgliano's first theorem is applicable only when-----

**c)** The deflection at any point of a perfect frame can be obtained by applying a unit load at the joint in the direction -------

**d)** The three moment equation is applicable only when----------

**e)** Bending moment at any section in conjugate beam gives in the actual beam
i) shaer force ii) slope
iii) deflection iv) bending moment

**f)** A single rolling load of 10 kN rolls along a girder of 10 m span. The absolute maximum bending moment will be ------.

**g)** For a single point load P moving on a symmetrical three hinged parabolic arch of span L, the maximum sagging moment will occur at ----- distance from ends.

**h)** Sinking an intermediate support of a continuous beam reduces ---------.
i) Negative moment at the support
ii) positive moment at the support
iii) Negative moment at the centre of span
iv) Negative moment to zero at the support

**i)** In the displacement method of analysis, the basic unknowns are
i) displacements and forces ii) forces
iii) displacements iv) none of the above

**j)** The maximum bending moment due to a train of wheel loads on a simple supported girder
i) always occurs at centre of span
ii) always occurs under a wheel load
iii) never occurs under a wheel load.
iv) none of the above

**Q2** **Answer the following questions: *Short answer type :*** **(2 x 10)**

**a)** Differentiate between force method and displacement method.

**b)** Explain degree of kinematic indeterminacy with example

**c)** Write use of influence line diagram.

**d)** Write theorem of three moments for a two span continuous beam with support settlement.

**e)** What is the advantage of an arch over a beam?
**f)** Explain principle of virtual displacement.
**g)** How normal thrust at a section in a three hinged arch is calculated?
**h)** Differentiate between cantilever beam and propped cantilever beam.
**i)** Show a suspension cable with different level?
**j)** Draw free body diagram of a space truss.

## Part – B (Answer any four questions)

**Q3** **a)** Calculate support moments using theorem of three moment **(10)**

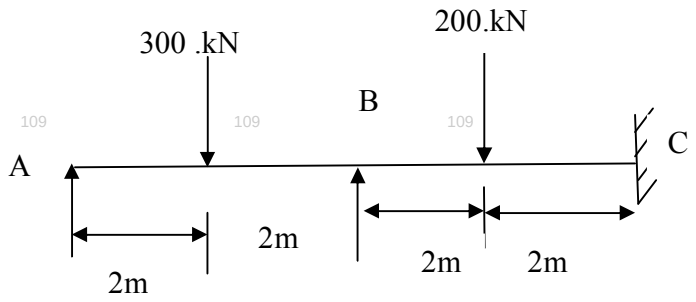



**Fig 1**

**b)** A fixed beam of span 12 m is loaded with a uniformly distributed load of 30 kN/m throughout the span in addition to a point load of 60 kN at centre of the span. Calculate fixed end moments and draw SFD and BMD. **(5)**

**Q4** **a)** A propped cantilever AB is of span 8m is loaded with an uniformly distributed load of 12 kN/m in left half of the span. End B is fixed. Calculate the reactions. **(10)**

**b)** A simply supported beam of span 10 m of uniform EI carries a concentrated load of 30kN at 6 m from left support. Calculate the maximum deflection applying moment area method. **(5)**

**Q5** **a)** Calculate the horizontal displacement of point C on the rectangular bent shown in Fig 2. Take E=200 kN/mm$^2$ and $I$ =450x10$^7$ mm$^4$ for all members. **(10)**

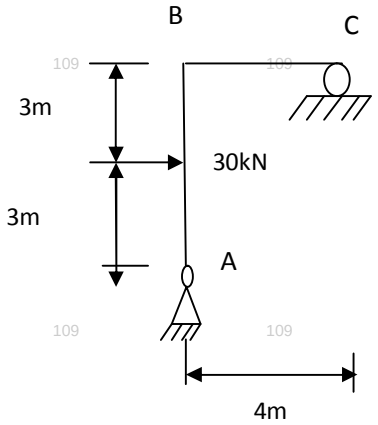
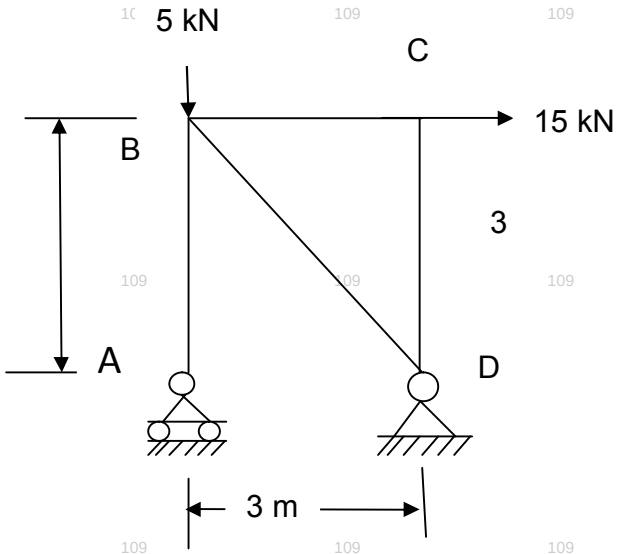



**Fig 2**

**b)** Explain compatibility requirements. **(5)**

**Q6** **a)** Calculate the vertical deflection of joint C as shown in figure below. Take cross sectional area of each member 1000 $mm^2$ and E = E=200 $kN/mm^2$ **(10)**




**b)** Discuss analysis of externally redundant plane truss. **(5)**

**Q7** **a)** Construct the influence line for bending moment and shear force at a section 2.5 m from left support of a simple supported beam of span 6 m. calculate the maximum bending moment and shear force when a UDL of 10 kN/m longer than the span moves across the beam. **(10)**

**b)** Draw ILD for normal thrust and bending moment at a section of a three hinged arch. **(5)**

**Q8** **a)** A three hinged circular arch of horizontal span of 21 m has a central rise of 4 m. It is loaded with a concentrated load of 80 kN at 6m from left end support. Calculate horizontal thrust, two support reactions and bending moment under the load. **(10)**

**b)** Prove that a uniformly distributed load shorter than span will cause maximum bending moment, when it occupies such a position, that the section divides the load in the same ratio, as it divides the span. **(5)**

**Q9** **a)** Calculate tension in the cable supported at different levels. Assume data required. **(10)**

**b)** . A three hinged parabolic arch of horizontal span of 30 m has a central rise of 5 m. Calculate maximum positive bending moment at a section 10 m from the left hand support when a uniformly distributed load of 60 kN/m rolls over the arch. Also calculate absolute maximum bending moment. **(5)**