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

Total Number of Pages : 02 **B.Tech.**
PCCE4204

4th Semester Back Examination 2017-18
STRUCTURAL ANALYSIS - I
BRANCH : CIVIL
Time : 3 Hours
Max Marks : 70
Q.CODE : C664

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks.
Answer all parts of a question at a place.

Q1 **Answer the following questions :** **(2 x10)**

a) Differentiate between static and kinematic indeterminacy with example.
b) Write advantages of fixed beam.
c) What is the kinematic indeterminacy of a fixed beam?
d) Explain Unit load method.
e) Define influence line.
f) Explain virtual work method.
g) What is meant by a perfect frame?
h) What are stiffening girders?
i) Explain radial shear force for a three hinged arch.
j) Sketch an externally redundant truss.

Q2 **a)** A continuous beam ABCD is simple supported at A, B, C and hinged at right end D. span AB=CD= 3m and BC= 4m. Span AB is loaded with an udl of 10kN/m and span CD is loaded with an udl of 20 kN/m throughout the span. There is no load on span BC. Using three moment equations, calculate the reactions and support moments. **(5)**

b) Derive the expression for fixed end moments in a fixed beam of span L and subjected to an udl *p* kN/m length. **(5)**

Q3 **a)** A propped cantilever of 10 meter span is fixed at the right hand support and loaded with point loads of 10kN, 20 kN and 15 kN at 3m,5m and 8 m from left support respectively. Calculate the reaction at propped end using consistent deformation method. **(5)**

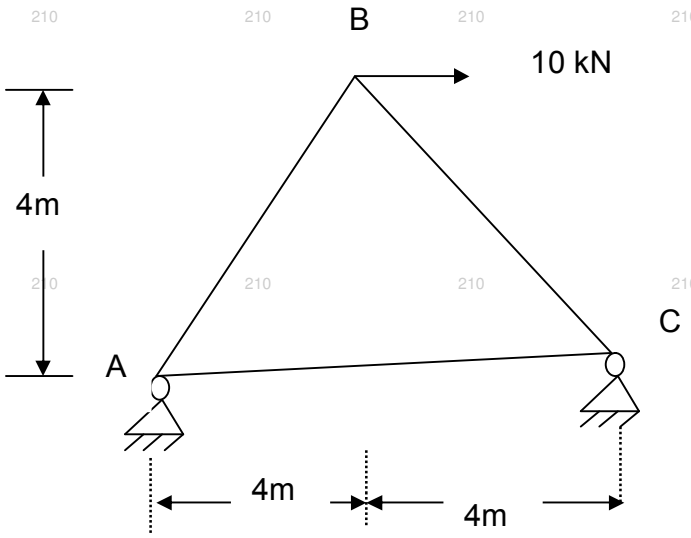
b) A continuous beam ABC is hinged at the ends A and C having AB= 6m and BC= 5m. Span BC is loaded an udl of 4kN/m throughout and span AB is loaded with a point load of 8 kN at mid span. If support B sinks by 10 mm with respect to support A, calculate moment at support B. **(5)**

Q4 **a)** A simple supported beam has a span of 16 meters. A uniformly distributed load of 16 kN/m and 4 m long crosses the span. Find the maximum bending moment produced at a point 7 meters the left support. **(5)**

b) Prove that when a series of a point loads crosses a girder, simply supported at its ends, the maximum bending moment at any section on the span occurs, when the average loading on the left of the section is equal to the average loading on the right of the section. **(5)**

Q5 **a)** Draw influence lines for horizontal thrust, bending moment, normal thrust and radial shear force, when a point load rolls over a parabolic three hinged arch. **(5)**

b) Calculate the vertical displacement of joint B of a truss shown in Figure below. The area of cross section of each member is 300 mm^2. Consider E = 200 kN/m^2. **(5)**



Q6 **a)** Calculate the deflection at free end of a cantilever beam of span 8 m and moment of inertia 4.75x 10^8 mm^4 by Unit Load method. The load at free end is 5 kN. Consider E = 200 kN/m^2. **(5)**

b) Explain principle of virtual forces and principle of virtual displacement. **(5)**

Q7 A cable of a suspension bridge has a span of 400m over supports, which are at the same level and a sag of 40 m vertically from the line of support to the lowest point on the cable at mid-san. It is stiffened by a three-hinged girder with hinged supports at the two ends and the third hinge at its mid point. The girder carries a three loads of 300 kN, 500 kN, 400 kN acting at 70m, 140m and 300m respectively from the left end. Draw the bending moment diagram for the girder giving values at salient points. **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Strain energy method

b) Space truss

c) Consistent deformation method

d) Fixed beams