KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

Marks Scored:

Level : B.E./B.Tech.
Year : III

Course : CIEG 305
Semester: I

Exam Roll No.:

Time: 30 mins.

F.M. : 10

Registration No.:

Date : JUN 17 2018

SECTION "A"
[20 Q.×0.5=10 marks]

1. Calculate the maximum BM introduced due to a UDL of 4 kN/m if the span of the cantilever is 1.8 m.
   a) 2.16 kN.m
   b) 1.08 kN.m
   c) 6.48 kN.m
   d) 5.48 kN.m

2. A simply supported beam of span L carries two equal concentrated loads, W at a distance of L/3 from either support. The maximum bending moment, M is:
   a) WL/2
   b) WL/4
   c) WL/3
   d) WL/5

3. The shape of bending moment diagram over the length of a beam having no external loading but only self-weight is:
   a) Linear
   b) Cubical
   c) parabolic
   d) circular

4. In a cantilever beam a point load is applied at the free end. Which one is correct?
   a) SF is uniform throughout the beam
   b) SF varies linearly from free end to fixed end
   c) BM is uniform throughout the beam
   d) (a) and (c)

5. The bending moment is maximum on a section where shear force:
   a) is maximum b) is equal c) is minimum d) changes sign

6. The moments in the arch will be zero if:
   a) Ends are hinged
   b) Ends are fixed
   c) The arch axis coincides with the line of thrust
   d) The arch axis is parallel to the line of thrust.

7. Three hinged arch is a _____ structure.
   a) Indeterminate
   b) Both (a) and (b)
   c) determinate
   d) depends upon the position of the 3 hinges

8. The value of horizontal thrust produced in an arch is:
a) $Wl^2/4$ b) $Wl^2/8$ c) $Wl^2/6$ d) $Wl^2/10$

9. A suspension cable, supporting loads will be under
a) Tension
b) Compression
c) bending
d) compression and bending

10. The maximum tension in a cable occurs
a) At the highest point in the cable
b) At the lowest point in the cable
c) At the center point of the cable
d) At the point where maximum sag is obtained

11. The influence line diagram for reaction at a support of a simply supported beam is
a) A triangle with ordinate 1 at that support
b) A triangle with ordinate 1 at the other support
c) A rectangle with ordinate 1
d) A rectangle with ordinate ½

12. The ratio of the maximum deflections of a simply supported beam with central load W and of a cantilever of same length and with a load W at its free end is
a) 1/8 b) 1/14 c) 1/10 d) 1/12

13. Horizontal reaction in a cable chord of span L having supports at same level and central dip y, subjected to a uniformly distributed load of w is given by
a) $wL^2/8y$ b) $wL^2/6y$ c) $wL^2/4y$ d) $wL^2/2y$

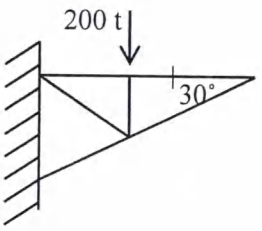
14. The number of independent equations to be satisfied for static equilibrium of a plane structure is
a) 1 b) 2 c) 3 d) 6

15. The ratio of the stresses produced by a suddenly applied load and by a gradually applied load on a bar is
a) 1 b) 2 c) ½ d) 3

16. Two beams of equal cross sectional area are subjected to equal bending moment. If one beam has square cross section and the other has circular section, then
a) Both beams will be equally strong
b) Circular section beam will be stronger
c) Square section beam will be stronger
d) The strength of the beam will depend on the nature of loading

17. An internally indeterminate structure
    a) Must be externally indeterminate
    b) Must be externally determinate
    c) May be unstable structure based on support
    d) Must be stable structure

18. In the truss shown in figure the force in member marked by |, is



    a) 100 t compressive
    b) Zero
    c) 200 t tensile
    d) indeterminate

19. A three hinged parabolic arch of uniform cross section has a span of 60 m and rise of 10 m. It is subjected to uniformly distributed load of intensity 10 kN/m throughout the span. The bending moment at 10 m from left hand support is
    a) 0 b) 4500 kN/m c) 750 kN/m d) 3000 kN/m

20. The principle of virtual work can be applied to elastic system by considering the virtual work of
    a) Internal forces only
    b) External forces only
    c) Internal as well as external forces
    d) External forces resulting in deflections

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SECTION "B"

Attempt *ALL* questions.
Assume suitable data wherever necessary

1. The three hinged stiffening girder of a suspension bridge of span 120 meters is subjected to two point loads of 120 kN at distances 25 m and 80 m from the left end. Find the shear force and bending moment for the girder at a distance of 50 m from the left end. The supporting cable has a central dip of 12 m. Find also the maximum tension in the cable and draw the BM diagram for the girder. [8]

2. Determine horizontal displacement of joint C under the application of 50 kN load at E (midpoint of CD) in the frame shown in figure 1. Flexural rigidity for all members are constant. Take E = 200 × 10^6 kN/m^2 and I = 300 × 10^{-6} m^4. Use virtual work method. [8]

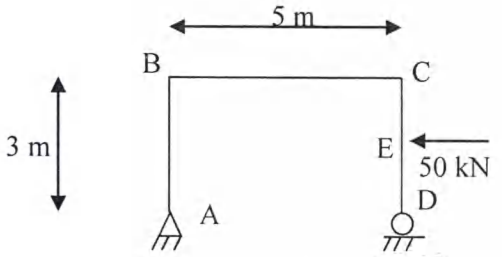

Figure 1

3. Determine the maximum forces in the members U1U2, L2U2 and L2L3 of the bridge truss shown in the figure 2 if a UDL of 15kN/m, longer than the span traverses along the bottom of the chord members. [8]

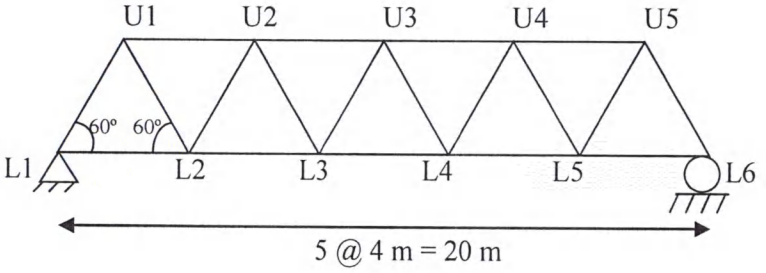

Figure 2

4. A three hinged parabolic arch ACB of span 30 m has its supports A and B at depths 4 m and 16 m below the crown hinge C, respectively. The arch carries a point load of 60 kN at a distance of 5 m from C at portion AC and a point load of 120 kN at a distance of 10 m from C at portion CB. Find the reactions at the supports and the bending moments under the loads. [8]

5. Determine the deflection and slope at free end of the beam shown in figure 3 using Macaulay's Method. The beam is subjected to 5 kN point load at the centre of span AB. Consider constant flexural rigidity. [8]

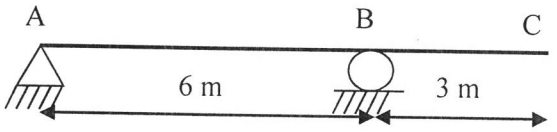

Figure 3