KATHMANDU UNIVERSITY
End Semester Examination
March/April, 2017

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 : APR 0 9 2017

SECTION "A"

[20 Q. × 0.5 = 10 marks]

1. Deflection of the free end of a cantilever beam, subjected to a concentrated load at the middle of the span is given by
   a. $PL^3/3EI$ b. $PL^3/48EI$ c. $PL^3/24EI$ d. $5PL^3/48EI$

2. A bar is subjected to a uniaxial load 5kN, having length 2 m, area of cross-section 20 mm^2, and modulus of elasticity 200 kN/m^2. The strain energy stored in the bar is given by
   a. 6250 kN.m b. 6520 kN.m c. 2500 kN.m d. 10000 kN.m

3. The shear force at the centre of simply supported beam of length l, with gradually varying load from zero at both ends to w per meter at the centre is,
   a. Zero b. wl/4 c. wl/2 d. $wl^2/4$

4. A simply supported beam "A" of length l, breadth b and depth d carries a central load W. Another beam "B" of the same dimensions carries a central load equal to 2W. The deflection of the beam "B" will be _____ as that of beam "A".
   a. One fourth b. One half c. Double d. Four times

5. When a rectangular beam is loaded transversely, the maximum compressive stress develops on
   a. Bottom fibre b. Top fibre c. Neutral axis d. Every cross section

6. If the width b and depth d of a beam simply supported with a central load are interchanged, the deflection at the centre of the beam will be changed in the ratio of
   a. b/d b. d/b c. $(d/b)^2$ d. $(b/d)^2$

7. In a three hinged arch, the third hinge can be kept at
   a. Crown of the arch
   b. Midpoint of the crown and left support hinge
   c. Midpoint of the crown and right support hinge
   d. Anywhere in the section of the arch

8. An arch may be subjected to
   a. Shear and axial force
   b. Bending moment and shear force
   c. Bending moment and axial force
   d. Shear force, thrust and bending moment

9. In which case the bending moment will be of triangular shape?
   a. A cantilever subjected to uniformly distributed load
   b. A cantilever carrying concentrated load at its free end
   c. A cantilever carrying uniformly distributed load
   d. A cantilever with free end subjected to a bending moment

10. Inclined loads generally cause
   a. Thrust in the beam
   b. Twisting of the beam
   a. Points of contraflexure
   d. Maximum shear force in the beam

11. The influence line for shear force at a section on a cantilever will be
   a. A rectangle of length equal to full length of span with unit ordinate
   b. A rectangle extending between free end and the section with unit ordinate
   c. A triangle extending for whole length of span with unit ordinate at fixed support
   d. A triangle extending between the section and the fixed end with unit ordinate at fixed support.

12. The vertical distance of the crown of the arch above the springing is called
   a. Span of the arch
   b. Rise of the arch
   c. Thickness of the arch
   d. Height of the arch

13. A suspension cable, supporting load, will be under
   a. Tension
   b. Bending
   c. Compression
   d. Shear

14. 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 centre of the cable
   d. At all points in the cable

15. The bending moment in a cable carrying a system of loads will be
   a. Maximum at the centre
   b. Minimum at the centre
   c. Zero at all points
   d. Maximum at all points

16. Beams composed of more than one material, rigidly connected together so as to behave as one piece are known as
   a. Compound beams
   b. Flexural beams
   c. Determinate beams
   d. Composite beams

17. The method of virtual work in the analysis of structures results in
   a. Compatible deformations
   b. Equilibrium of forces
   c. Stress strain relations
   d. Complementary stresses

18. Which of the following is a wrong conversion of real beam into conjugate beam?
   a. Free end is represented as fixed end.
   b. Internal roller support is represented as internal hinge.
   c. Hinged support at end is represented as fixed support.
   d. Internal hinge is represented as internal roller.

19. The impact factor *I.F.* for suddenly applied loading condition is
   a. 1
   b. 1.5
   c. 2
   d. 2.5

20. A single rolling load of 8kN rolls along a simply supported girder of span 15 meters. The absolute maximum bending moment will be:
   a. 8
   b. 15
   c. 30
   d. 60

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SECTION "B"

Attempt *ALL* questions.
Assume data if necessary.

1. Draw influence line diagram for the members U2U3 and U2L3 of the deck type girder as shown in Figure 1. Also find the maximum forces in the members subjected to 2kN/m longer than the span of the girder. [8]

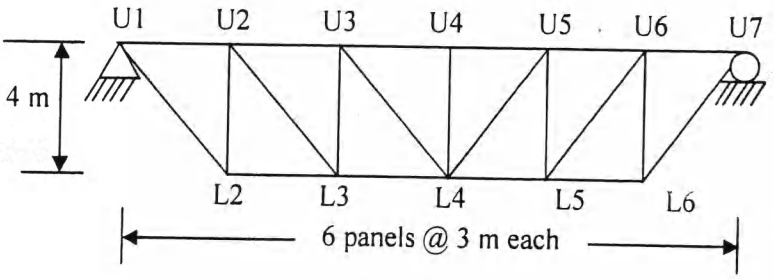

Figure 1

2. A three hinged parabolic arch ACB is hinged at the supports A and B which are below the crown hinge C by 3 m and 6.75 m respectively. The span of the arch is 22.5 m. The arch carries a uniformly distributed load of 30 kN/m from A to C. Find the reactions at the supports and the maximum positive and negative bending moments. [6]

3. Determine the vertical displacement of joint D of the truss shown in Figure 2. Use the method of virtual work. Axial rigidity AE is constant. Assume the members are pin connected at their ends. [8]

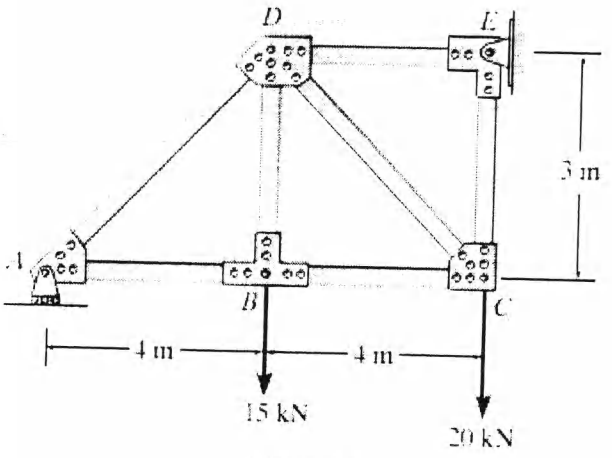

Figure 2

4. A system of 5 loads of 8 kN, 16 kN, 16 kN, 6 kN and 4 kN crosses a beam of 20 m span with 8 kN load leading. The distance between the loads 8kN and 16 kN is 2.4 m, 16 kN and 16 kN is 3.0 m, 16 kN and 6 kN is 2.4 m, and 6 kN and 4 kN is 1.8 m. Find the BM at the center of the span. Also find the absolute maximum bending moment on the beam. [6]

5. Determine the deflection at points B and C of the beam shown in Figure 3 using Conjugate Beam method. (Support A is fixed). Values for the moment of inertia of each segment are indicated in the figure. Take E = 200 GPa. [6]

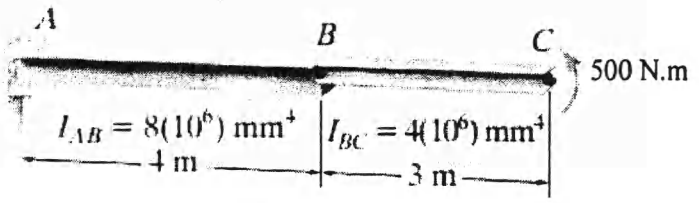

Figure 3

6. The three hinged stiffening girder of a suspension bridge of span 120 m is subjected to two point loads of 240 kN and 300 kN at distances 25 m and 80 m respectively from the left end. Find the shear force and bending moment for the girder at a distance of 40 m from the left end. The supporting cable has a central dip of 12 m. Also find the maximum tension in the cable and draw the BM diagram for the girder. [6]