KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Marks Scored:

Level : B.Tech.
Year : II

16 FEB 2025

Course : ENVE 205
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date :

SECTION "A"
[20 Q. × 1 = 20 marks]

Choose and encircle the most appropriate answers from the given choices.

1. A structure is said to be statically indeterminate if
   a. The number of equilibrium conditions exceeds the number of unknown reaction
   b. The number of unknown reaction exceeds the number of equilibrium conditions
   c. The number of equilibrium conditions equal the number of unknown reaction
   d. The number of equilibrium conditions is less than unity.

2. A simply supported beam of span (l) carries a UDL (w N per unit length) over the whole span. The bending moment diagram will be a
   a. Parabola with maximum ordinate at one end of the beam
   b. Parabola with maximum ordinate at the centre of the beam
   c. triangle with maximum ordinate at the centre of the span
   d. triangle with maximum ordinate at the end of the span

3. The point of contra-flexure occurs only in
   a. Continuous beams
   b. Cantilever beams
   c. Overhanging beams
   d. Simply supported beams

4. Hooke's law holds good up to
   a. Proportional limit
   b. Yield point
   c. Elastic limit
   d. Plastic limit

5. The flexural rigidity for the deflection of beam is expressed as
   a. I/E b. E/I c. EI d. 1/EI
   Where E=modulus of elasticity and I=moment of inertia

6. A circular shaft of length L subjected to a torque T, G rigidity modulus and J is the polar moment of inertia, then the total angle of twist is given by
   a. $\frac{TL}{GJ}$ b. $\frac{Tj}{GL}$ c. $\frac{TL}{GI}$ d. $\frac{GJ}{TL}$

7. If a member is subjected to an axial tensile load, the plane inclined at 450 to the axis of loading carries
   a. Minimum normal stress
   b. Maximum normal stress
   c. Maximum shear stress
   d. Nominal normal stress

8. The expression $EI\frac{d^4y}{dx^2}$ at a section of a member represents
   a. Shearing force b. Rate of loading c. Bending moment d. Slope

9. Choose the wrong statement
   a. Column is a vertical member of a structure, which carries an axial compressive load.
   b. The ratio of length of a column to its minimum radius of gyration is called slenderness ratio.
   c. A column tends to buckle in the direction of the minimum moment of inertia.
   d. The equivalent length of a column with one end fixed and other end free is half of its actual length.

10. In Mohr's circle method, compressive direct stress is represented on
    a. Negative x-axis b. Positive x-axis c. Negative y-axis d. Positive y-axis

11. A cylindrical vessel is said to be thin if the ratio of its internal diameter to the wall thickness is
    a. Less than 20 b. More than 20 c. Equal to 20 d. 0

12. When a cantilever beam is loaded with point load acted downwards at its free end, the maximum compressive stress shall develop at
    a. Top fibre b. Neutral axis c. Center of gravity d. Bottom fibre

13. Bending moment M and torque T is applied on a solid circular shaft. If the maximum bending stress equals to maximum shear stress developed, then M is equal to
    a. T/2 b. T c. 2T d. 4T

14. The Poisson's ratio of a material which has Young's modulus of 120GPa and shear modulus of 50GPa, is
    a. 0.1 b. 0.2 c. 0.3 d. 0.4

15. Principal stresses at a point in plane stressed element are $\sigma_x = \sigma_y$ 5000N/cm^2. Normal stress on the plane inclined at 45° to the x-axis will be
    a. 0 b. 5000N/cm^2 c. 7070N/cm^2 d. 10000N/cm^2

16. The product of inertia of a square section with side length "b" about its centroidal axes is given by
    a. $\frac{b^4}{12}$ b. $\frac{b^4}{6}$ c. $\frac{b^4}{3}$ d. 0

17. A solid circular shaft of diameter D carries an axial load W. If the same load is applied axially on a hollow circular shaft of inner diameter as D/2, the ratio of stresses in a solid shaft to that of hollow shaft would be
    a. ½ b. ¼ c. ¾ d. 4/3

18. The ratio of crippling load, for a column of length(l) with both ends fixed to the crippling load of the same column with both ends hinged, is equal to
    a. 2.0 b. 4.0 c. 0.25 d. 0.50

19. If the diameter of a long column is reduced by 20%, the percentage of reduction in Euler's buckling load is
    a. 4 b. 36 c. 49 d. 59

20. Find the degree of static indeterminacy of the following structure
    a. 3 b.2
    c. 1 d.0

KATHMANDU UNIVERSITY
End Semester Examination
February, 2025

Level : B.Tech.
Year : II
Time : 2 hrs. 30 mins.

16 FEB 2025

Course : ENVE 205
Semester : II
F. M. : 55

SECTION "B"

Attempt *ALL* questions. Assume suitable data if necessary.

1. Draw the Shear force diagram (SFD) and Bending moment diagram (BMD) for the given beam shown in figure 1. Also, indicate salient features, if any. [12]

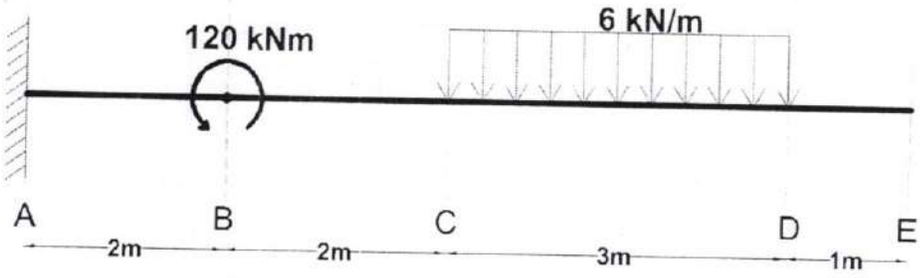


Figure 1

2. Explain product of moment of inertia. Find the principal moment of inertia and locate the principal axes for the given section shown in figure 2. [2+8]

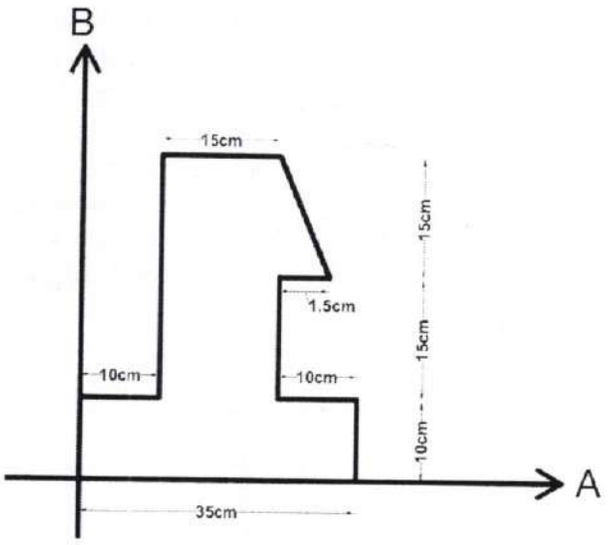


Figure 2

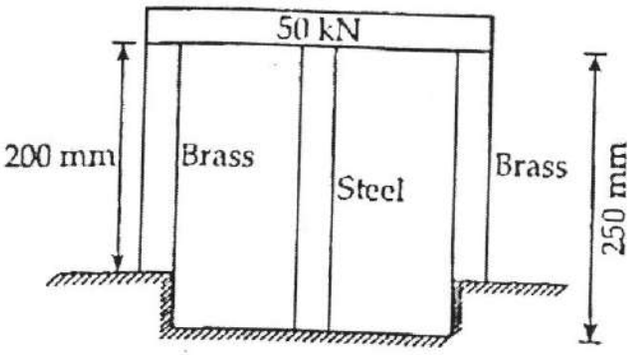
3. Derive an expression to find the maximum slope and deflection of simply supported beam of span L carrying a uniformly distributed load of intensity w per unit length over the whole span. [5]

P.T.O.

4. Explain Theory of Pure bending and list out its important assumptions. A timber beam 100 mm wide and 200 mm deep is to be reinforced by bolting on two steel flitches each 150 mm by 12.5 mm in section. Calculate the moment of resistance in the following cases:
   a. flitches attached symmetrically at the top and bottom
   b. flitches attached symmetrically at the sides

   Allowable stress in timber is 6 N/mm^2. What is the maximum stress in the steel in each case? Take $E_s = 2 * 10^5$N/mm^2 and $E_t = 1 * 10^4$N/mm^2. [3+8]

5. A steel rod of cross sectional are 1000mm^2 and two-brass rod each of cross sectional area 800mm^2 together support a load of 50kN. Calculate the stresses in the rod. Take modulus of elasticity of steel and brass as 200GPa and 100GPa respectively. [6]



6. A thin cylindrical shell is 4m long and has 1m internal diameter and 12mm metal thickness. Calculate the maximum intensity of shear produced and change in dimension of shell if it is subjected to an internal pressure of 2N/mm^2. Take$E = 2 * 10^5$N/mm^2 and μ=0.3. [5]

7. What are the limitations of Euler's theory of buckling of column? A built-up beam shown in figure below is simply supported at its ends. Compute its length given than when it is subjected to a load of 40kN per meter length, it deflects by 1cm. Find out the safe load if this beam is used as a column with both ends fixed. Assume factor of safety of 4. Use Euler's formula. Take E=210GN/m^2. [1+5]