Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
January, 2018

Level : B. Tech.
Year : II

Course : ENVE 205
Semester : II

Exam Roll No. :

Time : 30 mins.

F. M. : 20

Registration No.:

Date : JAN 14 2018

SECTION "A"
[20 Q. x 1 = 20 marks]

Circle the correct answer from the given choices. Attempt all the questions.

1. A beam is said to have been subjected to pure bending moment when
   a) Shear force is maximum
   b) The load is applied as UDL throughout the section
   c) Shear force in a length is zero
   d) The load is applied at the mid span section only

2. Strain energy of any member may be defined as work done on it
   a) to deform it
   b) to resist elongation
   c) to resist shortening
   d) all of the above

3. In a shaft subjected to pure torsion cracks, the cracks will start
   a) At the center of cross-section
   b) On the periphery
   c) Throughout the section simultaneously
   d) None of the above

4. The strain energy stored in a spring, when subjected to maximum load, without suffering a permanent distortion, is known as
   a) Impact energy
   b) Proof resilience
   c) Proof stress
   d) Modulus of resilience

5. The shear force diagram for a cantilever beam of length l and carrying a gradually varying load from zero at free end and w per unit length at the fixed end is a
   a) Horizontal straight line
   b) Vertical straight line
   c) Inclined line
   d) Parabolic curve

6. Compression member of truss is called
   a) Tie
   b) Strut
   c) Boom
   d) Rod

7. The bending equation is
   a) $M/I = \sigma/y = E/R$
   b) $T/J = \tau/r = c\theta/l$
   c) $M/y = \sigma/I = E/R$
   d) $T/r = \tau/J = c\theta/l$

8. In a fixed beam, slopes at the ends are
   a) minimum
   b) maximum
   c) same as at the center
   d) zero

9. The moment of resistance developed in beam subjected to bending moment, at any instant, be
   a) Equal to bending moment applied at that section
   b) Greater than bending moment applied
   c) Less than the bending moment applied
   d) Always the full strength of the beam

10. According to the Euler's Column theory, the crippling load for a column length (l) hinged at one end and fixed at other, is
   a) Π^2EI / l^2 b) $2\Pi^2EI / l^2$ c) $\Pi^2EI / 4l^2$ d) $\Pi^2EI / 2l^2$

11. The maximum deflection of cantilever beam subjected to UDL of "*w*" per unit run is:
   a) $wl^3/3EI$ b) $wl^2/2EI$ c) $wl^4/8EI$ d) $wl^3/8EI$

12. Twisting moment is moment applied in the plane of cross section about
   a) Longitudinal axis
   b) Neutral axis
   c) XX axis
   d) YY axis

13. The moment of inertia of an area is always least with respect to
   a) Vertical axis
   b) Bottom most axis
   c) Radius of gyration
   d) Central axis

14. The torsional rigidity of a shaft is given by
   a) T/J b) T/G c) T/θ d) T/r

15. The term J/R in the torsion equation is called
   a) Shear Modulus
   b) Section Modulus
   c) Torsional Resilience
   d) Polar Modulus

16. The relationships between three elastic constants E,G and K are:
   a) $E = \frac{9KG}{3K+G}$ b) $G = \frac{9KE}{3E+G}$ c) $E = \frac{9KG}{K+3G}$ d) $K = \frac{9EG}{3G+E}$

17. A shaft revolving at ω rad/s transmits torque (T) in N-m. The power developed is
   a) 2Π* Tω /75 Watts
   b) 2* Tω Watts
   c) 2Π* Tω Watts
   d) Tω Watts

18. Two shafts 'A' and 'B' are made of same material. The shaft 'A' is solid and has diameter D and the shaft 'B' is of diameter D/2. The strength of shaft 'B' is ..... as that of shaft 'A'.
   a) Eight times b) One-eighth c) One-fourth d) Four times

19. When a body is subjected to three mutually perpendicular stress of equal intensity, the ratio of direct stress to corresponding volumetric strain is known as
   a) Modulus of rigidity
   b) Modulus of Elasticity
   c) Bulk Modulus
   d) Young's modulus

20. The strain energy stored in a body when suddenly loaded is .....the strain energy stored when same load is applied gradually
   a) Equal to b) One half c) Twice d) Four times

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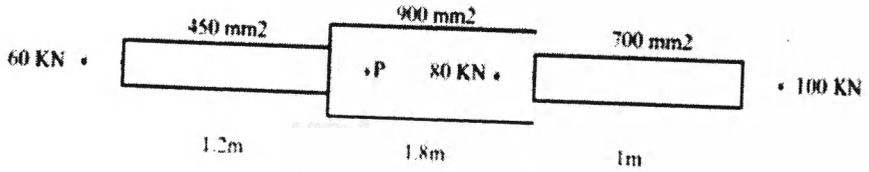
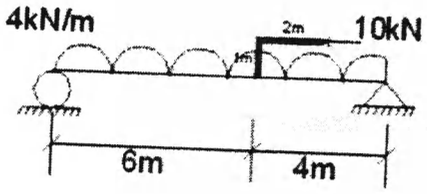
SECTION "B"

Answer all the questions. The data or information not given in the questions should be assumed properly.

1. A steel bar of varying cross-sections is subjected to axial forces as shown below. Find the value of 'P' to keep the system in equilibrium. Take E=210KN/mm^2.Calculate the total elongation of the bar. [4+4]

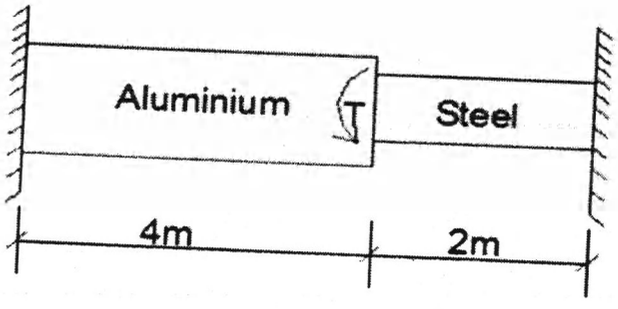


2. Draw Shear force diagram and Bending moment diagram of following structure. [4+4]

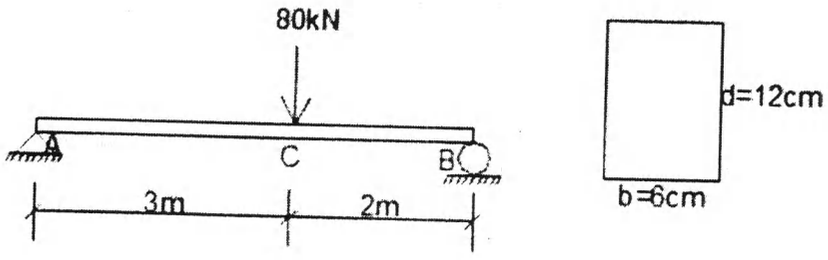


3. A horizontal cantilever of length l supports a UDL of w per unit length run along its length. The cantilever is propped to the level of the fixed end at a distance ¾ l from the fixed end. Find the reaction of the prop. [7]

4. Two solid shafts of different material are rigidly connected together and attached to rigid supports as shown in figure. The aluminum shaft is 4cm in diameter and G_{al}=30 Gpa and steel portion has 2cm in diameter and G_{st}=90 Gpa. If a torque of 20KN-cm is applied at the junction of two materials, determine the shearing stresses. [4+4]



5. For a beam loaded as shown in the figure, determine the maximum shearing stresses in the beam. Also determine the shearing stress at a point 3cm below the top fiber of the beam at a section 1m from support A. [3+5]



6. A 10 mm diameter mild steel bar of length 1.5 metre is stressed by a weight of 120 N dropping freely through 20mm before commencing to stretch the bar. Find the maximum instantaneous stress and the elongation produced in the bar. Take $E = 2*10^5 N/mm^2$ [4+4]

7. A column of timber is 6m long and hinged at one end and fixed at the other. Determine the crippling load and safe load for the column. Take factor of safety=2.5 and cross section of the column as shown below. $E=10\ KN/mm^2$ [4+4]