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Reg. No. : | | | | | | | | | | | | |

Question Paper Code: U3103

B.E./B.Tech. DEGREE EXAMINATION, NOV 2022

Third Semester

Civil Engineering

21UCE303 - STRENGTH OF MATERIALS

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

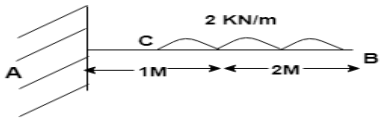
PART A - (5 x 1 = 5 Marks)

1. Limit of proportionality depends upon _____ CO1- U

   (a) Area of cross-section (b) Type of loading

   (c) Type of material (d) All of the above

2. What is the SF at support B? CO2- App



   (a) 5KN (b) 3KN (c) 2KN (d) 0KN

3. A beam which is inbuilt in at its support is called _____ CO1- U

   (a) Cantilever beam (b) Simply supported beam (c) Fixed beam (d) Continuous beam

4. _____ of column mainly depends upon end conditions. CO1- U

   (a) Radius of gyration (b) Slenderness ratio (c) Factored load (d) Effective length

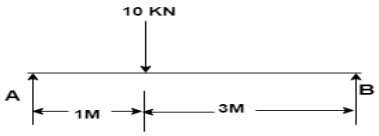
5. For $\sigma 1\ 2 \neq \sigma$ and $\sigma 3 = 0$, what is the physical boundary for Rankine failure theory? CO1- U

   (a) A rectangle (b) An ellipse (c) A square (d) A parabola

PART – B (5 x 3= 15 Marks)

6. If a material had a modulus of elasticity of 2.1 kgf/cm^2 and a modulus of rigidity of 0.8 kgf/cm^2 then what will be the approximate value of the Poisson's ratio? CO3- App

7. Find the reaction at simple support A? CO2- App



8. Calculate the maximum deflection of a fixed beam carrying udl of 5 kN/m. The span of beam is 6 m. Take E = 200kN/m^2 & I = 5×10^7 mm^4. CO3- App

9. What are the assumptions made in Euler's column. CO3- App

10. Write the Winkler-Bach formula for a curved beam CO1- U

PART – C (5 x 16= 80Marks)

11. (a) A Circular rod of diameter 10mm and length of 200mm elongates 0.50mm under an axial load of 50KN.If the change in diameter is 0.01mm.Calculate the values of three modulus and Poisson's ratio. CO3- App (16)

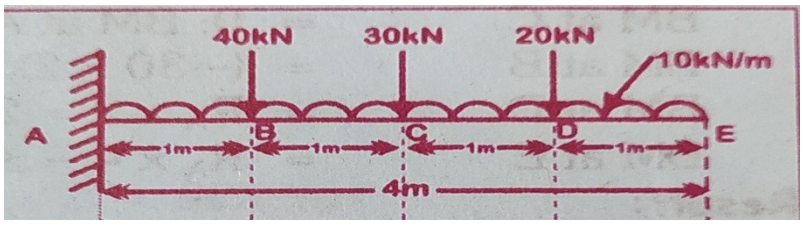
Or

(b) An element of strained material has tensile stress of 500MN/m^2 and compressive stress of 350MN/m^2 acting two mutually perpendicular planes and equal shear stresses of 100MN/m^2 on these planes .Find the principal stresses ,Principal planes. Find also maximum shear stress. CO2- App (16)

12. (a) A Simply supported beam of span 6m is subjected to concentrated point loads of 10KN, 15KN, and 20KN at 2m, 4m and 5m respectively from left support. Draw SFD and BMD. CO2- App (16)

Or

(b) Draw the SFD and BMD for the cantilever beam as shown in fig. CO2- App (16)



13. (a) A continuous beam ABC covers two consecutive span AB and BC of lengths 4m and 6m, carrying udl of 6 kN/m and 10 kN/m respectively if the ends A & C are simply supported, find the support moments at A ,B & C. Draw also BM and SF diagrams. CO2- App (16)

Or

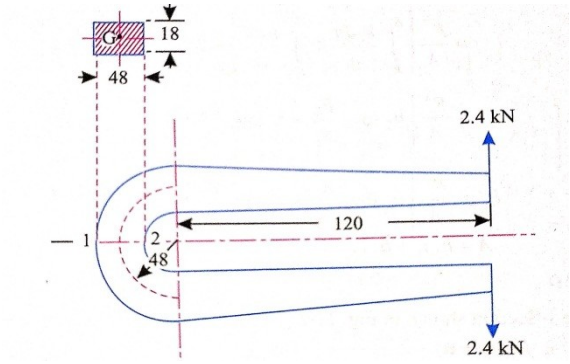
(b) A fixed beam AB of length 6m carries point loads of 160 KN and 120 KN at a distance of 2m and 4m from the left end A. Find the fixed end moments and the reactions at the supports. Draw B.M and S.F diagrams — CO2- App — (16)

14. (a) A steel tube 4.5m long ,30mm external diameter and 3mm thickness is used as a strut .Calculate the Euler's crippling load for the following end conditions. E=2 $X10^5$. — CO3- App — (16)
    a) When both ends hinged
    b) When one end is hinged and other fixed
    c) When one end is fixed and the other free
    d) When both ends are fixed

Or

(b) A solid round bar 4m long and 6cm in diameter is used as a strut .Take E=2 $X10^5$. — CO3- App — (16)
    a) When both ends hinged
    b) When one end is hinged and other fixed
    c) When one end is fixed and the other free
    d) When both ends are fixed

15. (a) A fig. shows a frame subjected to a load of 2.4 KN. — CO3- App — (16)



Find (i) The resultant stresses at point 1 and 2
(ii) Position of neutral axis

Or

(b) Find the value of the minor principal stress at which yielding will commence ,according to each of the following criteria of failure : — CO3- App — (16)
(a) Maximum shearing stress (b) Maximum total strain energy
(c) Maximum shear strain energy .In a steel member ,at a point the major principal stresses is 180MN/m^2 and the minor principal stress is compressive .If the tensile yield point of the steel is 225MN/m^2, Take Poisson's ratio = 0.26