Roll No. ....

3rd Sem / Branch : Civil Engineering/ Highway Engg.

Subject:- STRUCTURAL MECHANICS

Time : 3Hrs.   M.M. : 100

SECTION-A

Note: Multiple choice questions. All questions are compulsory.

(10x1=10)

Q.1   A brittle material has   (CO1)
a)   No plastic zone   b)   No elastic zone
c)   Large plastic zone   d)   None of these

Q.2   The ratio of the lateral strain to the linear strain is called
(CO2)
a)   Poisson's ratio   b)   Bulk modulus
c)   Modulus of elasticity   d)   Modulus of rigidity

Q.3   At the point of contraflexure   (CO3)
a)   B.M. is minimum
b)   B.M. is maximum
c)   B.M. is either zero or changes sign
d)   None of these

Q.4   The unit of momentum of inertia is   (CO4)
a) L_3 b) L^2
c) L^3 d) L^4

Q.5   Bending stresses are also known as   (CO5)
a)   Shear stress
b)   Temperature Stresses
c)   Longitudinal stresses
d)   Hoop stresses

Q.6   In an I-section, shear stress distribution abruptly changes.   (CO6)
a)   In the flange
b)   In the web
c)   At neutral axis
d)   At the junction of flange and web

Q.7   For long columns, the value of buckling load is .... crushing load.   (CO8)

a)   Less than   b)   More than
c)   Equal to   d)   None of these

Q.8   The Euler's formula holds good only for   (CO8)
a)   Long column   b)   Short column
c)   Medium column   d)   Weak column

Q.9   A structure consisting of a number of members connected to each other to support external load without going any geometrical distortion is known as
a)   Column   b)   Beam   (CO9)
c)   Frame   d)   None of these

Q.10   In a perfect frame, the relation between number of joints 'j' and number of members 'n' is   (CO9)
a)   n=2j
b)   n=2j+3
c)   n=2j-3
d)   None of these

SECTION-B

Note: Objective type questions. All questions are compulsory.

(10x1=10)

Q.11   The area under stress-strain curve indicates toughness. (True/False)   (CO1)

Q.12   When a material can be drawn into wires, it is called a...........material. (Brittle material/ Ductile material)
(CO1)

Q.13   Modulus of elasticity is the ratio of stress to .... (Load/ Strain)   (CO2)

Q.14   The bending moment at the fixed end of a cantilever beam is............(Minimum/ Maximum)   (CO3)

Q.15   The moment of inertia of a body is always minimum with respect to its..............
(Bottom Axis/ Centroidal Axis)   (CO4)

Q.16   Moment of resistance = ...X section modulus (Warping stress/ Bending stress)   (CO5)

Q.17   The shear stress at the N.A. is ....
(Maximum/ Minimum)   (CO6)

Q.18   The strength of the column depends upon the ....and its end conditions.
(Slenderness ratio/ Effective span)   (CO8)

Q.19   The maximum limiting load at which the column tends to have lateral displacement is called............ (Live load/ Buckling load)   (CO-8)

Q.20 The basic perfect frame is a .... (Rectangle /Triangle) (CO9)

SECTION-C

Note: Short answer type questions. Attempt any twelve questions out of fifteen questions. (12x5=60)

Q.21 Write a short note on "Mechanical Properties of Steel". (CO1)

Q.22 Draw the stress-strain diagram for mild steel (CO2)

Q.23 A load of 9.5 KN is to be raised with the help of a steel wire. Find the minimum diameter of the steel wire, if the stress is not to exceed 150 MPa. (CO2)

Q.24 Define temperature stresses and temperature strain for yield supports. (CO2)

Q.25 Define bending moment and bending moment diagram (CO3)

Q.26 A cantilever of length 4m carries a UDL of 1.5 KN/m over the whole span and a point load of 2.5 KN at the free end. Draw the SFD and BMD for the cantilever. (CO3)

Q.27 Draw the SFD and BMD for a simply supported beam carrying a point load at the mid span. (CO3)

Q.28 Find the moment of inertia of T-section as shown in fig.1 about X-X and Y-Y axis passing through the centroid of the section (CO4)

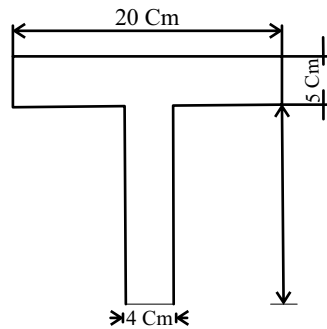

Fig.-1

Q.29 A rectangular beam 350 mm deep is simply supported over a span of 4.5 m. What uniformly distributed load per meter the beam may carry, if the bending stress is not to exceed $150 \, N/mm^2$? Take $I=8X10^6 \, mm^4$ (CO5)

Q.30 Write the assumptions made in the theory of simple banding. (CO5)

Q.31 Draw the detailed shear stress distribution diagram for a rectangular section of a beam. (CO6)

Q.32 A simply supported beam of length 3 m is subjected to a central point load of 9.5 KN. Find the maximum slope and deflection of the beam. Assume $E=200 \, KN/mm^2$ and $I=10X10^6 \, mm^4$ (CO7)

Q.33 Derive the expression for a maximum slope and deflection for a simply supported beam carrying a point load at its mid span. (CO7)

Q.34 Write the different end conditions of a loaded column along with their diagrams. (CO8)

Q.35 Define a support and explain its types for trusses along with neat sketches. (CO9)

SECTION-D

Note: Long answer type questions. Attempt any two questions out of three questions. (2x10=20)

Q.36 A bar 300 mm long is 50 mm X 50mm in section for 125 mm of its length, 25 mm diameter for 75 mm length and 40 mm diameter for the remaining length. If the tensile force of 80 KN is applied to the bar, Calculate the stresses induced in the different sections and total elongation of the bar. Take $E=2x10^5 \, N/mm^2$ (CO2)

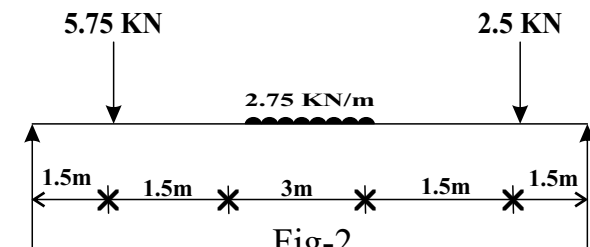Q.37 Draw the SF and BM diagrams of the loaded beam as shown in fig.-2. (CO3)

Fig-2

Q.38 Explain the different types of beams along-with their neat sketches. (CO3)

Note: Course Outcome (CO) mentioned in the question paper is for official purpose only.