END SEMESTER/ RE-TEST EXAMINATION, 2020
Semester: 3rd
Subject Code: CT-303
Subject: Strength of Materials
Full Marks: 70
Time: 3 Hours

The Question Paper consists of two parts: Part-A and Part-B. Both are compulsory.

Part-A (Marks = 25)

All questions are compulsory

Q1- Choose the correct answer: (15)

(i) The stress which acts in a direction perpendicular to the area is called _____
a) Shear stress
b) Normal stress
c) Thermal stress
d) None of the mentioned

(ii) The property by which a body returns to its original shape after removal of the force is called _____
a) Plasticity
b) Elasticity
c) Ductility
d) Malleability

(iii) Which law is also called as the elasticity law?
a) Bernoulli's law
b) Stress law
c) Hooke's law
d) Poisson's law

(iv) The materials which have the same elastic properties in all directions are called _____
a) Isotropic
b) Brittle
c) Homogeneous
d) Hard

(v) The body will regain it is previous shape and size only when the deformation caused by the external forces, is within a certain limit. What is that limit?
a) Plastic limit
b) Elastic limit
c) Deformation limit
d) None of the mentioned

(vi) What the number that measures an object's resistance to being deformed elastically when stress is applied to it?
a) Elastic modulus
b) Plastic modulus
c) Poisson's ratio
d) Stress modulus

(vii) Which point on the stress strain curve occurs after the ultimate point?
a) Last point
b) Breaking point
c) Elastic limit
d) Material limit

(viii) Where is the necking region?
a) The area between lower yield point and upper yield point
b) The area between the plastic limit and elastic limit
c) The area between the ultimate point and initial point
d) The area between the ultimate point and rupture

(ix) SI units of shear force is _____
a) kN/m
b) kN-m
c) kN
d) m/N

(x) At the point of contraflexure, the value of bending moment is _____
a) Zero
b) Maximum
c) Can't be determined
d) Minimum

(xi) SI units of Bending moment is _____
a) kN
b) kN^2
c) kNm
d) km

(xii) Torque is _____ moment.
a) Twisting
b) Shear
c) Bending
d) Couple

(xiii) The SI units for torsion is _____
a) N m

b) N
c) N/m
d) m

(xiv) The intensity of shear stress at a section is _____ to the distance of the section from the axis of the shaft.
a) Inversely proportional
b) Directly proportional
c) Equal
d) Parallel

(xv) The shear stress is _____ at the axis of the shaft.
a) Minimum
b) Maximum
c) Zero
d) Uniform

Q2- Fill in the blanks. (5)

(i) A cantilever beam subjected to point load at its free end, the maximum bending moment develops at the _____ of the beam.
(ii) Bending moment in a beam is maximum when the shear force is _____.
(iii) A simply supported beam of span "x" meters carries audl of "w" per unit length over the entire span, the maximum bending moment occurs at _____.
(iv) Hinge support is called as _____.
(v) Roller support is same as _____ support.

Q3- Match the following. (5)

Group A	Group B
(i) Ratio of lateral strain to longitudinal strain	(a) strain
(ii) Ratio of stress to strain	(b) lateral strain
(iii) Ratio of extension to original length	(c) Young's modulus
(iv) Ratio of axial pull to area of the section	(d)Poisson's ratio
(v) Ratio of change in diameter to original diameter	(e) Tensile stress

Part-B (Marks = 45)
Answer any five (5) questions

Q4- (a) A bar ABCD 950mm long is made up of three parts AB,BC and CD of lengths 250mm, 450mm and 250mm respectively. AB and CD are cylindrical having diameters 25mm and 15mm respectively. The rod BC is square section 30mm x 30mm. the rod is subjected to a pull of 26000N. Find, stresses in the three parts of the rod, extension of the rod. Given $E=2x10^5 N/mm^2$. **(6)**

(b) An elastic rod 25mm in diameter, 200mm long extends by 0.25mm under a tensile load of 40 kN. Find the intensity of stress, the strain and the elastic modulus for the material of the rod. **(3)**

5Q: A cast iron bracket subjected to bending has a cross section of I form with unequal flanges. The total depth of the section is 280mm and the metal is 40mm thick throughout. The top flange is 200mm wide and the bottom flange is 120mm wide. Find the position of the neutral axis and the moment of inertia of the section about the neutral axis and determine the maximum bending moment that should be imposed on this section if the tensile stress in the top flange is not to exceed $20N/mm^2$. What is the value of maximum compressive stress in the bottom flange? **(9)**

Q6- (a) For a given material the Young's modulus is $1.1x10^5$ N/mm^2 and modulus of rigidity is $0.43x10^5 N/mm^2$. Find the bulk modulus and lateral contraction of a round bar of 40mm diameter and 2.5m length when stretched by 2.5mm. **(5)**

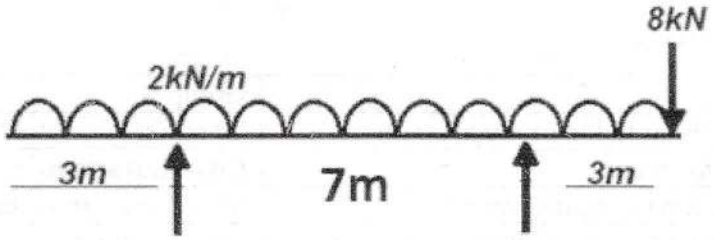
(b) Describe the theory of simple bending with respect to neutral layer. **(4)**

Q7- At a certain point in a strained material the principal stresses are 100 N/mm^2 and 40 N/mm^2 both tensile. Find the normal, tangential and resultant stresses across a plan through the point at 48^0 to the major principal plane, using Mohr's circle of stress. **(9)**

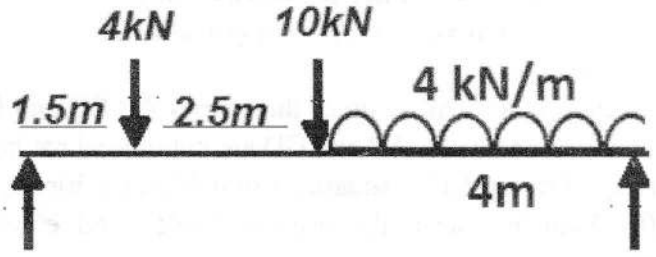
Q8- (a) Derive a relationship for section modulus of rectangular and circular section. **(4)**

(b) A cast iron beam 20mmx20mm in section and 1m long and supported at the ends fails when a central load of 640 N is applied. What UDL will break a cantilever of the same material 50mm wide, 100mm deep and 2m long? **(5)**

Q9- Draw the shear force and bending moment diagram for the given beam as below. Also indicate the location and magnitude of maximum bending moment. **(9)**



Q10- Draw the shear force and bending moment diagram for the given beam as below. Also find the magnitude of maximum bending moment. **(9)**



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