(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

THIRD SEMESTER [B.TECH] NOVEMBER-DECEMBER 2018

Paper Code: ETCE-203 *Subject: Strength of Materials*

Time: 3 Hours *Maximum Marks: 75*

Note: Attempt five questions in all including Q no.1 which is compulsory. Select one question from each unit. Assume suitable missing data, if any.

Q1 Attempt **all** parts:- **(10x2.5=25)**

(a) What do we mean by longitudinal strain, lateral strain and poison's ratio?

(b) What do we mean by principle planes and principle stresses?

(c) A prismatic bar of volume V is subjected to a tensile force in longitudinal direction. If poisson's ratio of the material is μ and longitudinal strain is e. Find the final volume of the bar.

(d) Define point of contraflexure.

(e) Differentiate between a fixed support and simple support with the help of free body diagram.

(f) What is pure bending? Give two examples of pure bending.

(g) What is middle third rule? For no tension criteria find the expression for care of a solid circular section.

(h) State castigliano's theorem.

(i) Write the assumptions of theory of pure torsion.

(j) What are the limitations of Euler's formula?

UNIT-I

Q2 Two vertical rods, one of steel and other of copper are each rigidly fastened at the upper and 600m apart. Each rod is 3m long and 100mm^2 in cross-sectional area. A horizontal cross bar connects the lower end of rods and on it is placed a load of 100KN so that the cross bar remains horizontal. Find the position of load on cross bar and estimate the stress in each rod. E_{steel}=210 GPa and E_{copper}=120GPa. **(12.5)**

Q3 (a) Explain the concept of Mohr's circle for determining stresses and strain. **(6.5)**

(b) Explain why do we need a failure theory. Explain in detail the concept of any one failure theory. **(6)**

UNIT-II

Q4 A beam 8.5m long rests on supports 5m apart. The right hand end overhanging by 2m and left and by 1.5m, the beam carries a UDL of 50 KN/m run between the supports only. The beam also carries a point load of 60 KN at the extreme right hand end and a point load of 40 KN at the left end. Construct the shear force and bending moment diagrams stating there an all the important values of shear force and bending moment. State the position of point of inflexion on the beam. **(12.5)**

Q5 Compare the flexural strength of the following three beams of equal weight:- **(12.5)**

(a) I-section 30cmx15cm having 2cm thick flange and 1.25 cm thick web.

P.T.O.

(b) Rectangular section having depth equal to twice the depth.
(c) Solid circular section

UNIT-III

Q6 A masonry dam, 8m high, 1.5m wide at top and 4m wide at the base has its water face vertical and retains water to a depth of 6m. Find the maximum and minimum stress intensities at the base. The density of water is 1000 Kg/m^3 and that of the masonry is 2240 Kg/m^3. **(12.5)**

Q7 A simply supported beam of span L is loaded with UDL of intensity w over the whole span. Using conjugate beam method. Calculate slopes at the end and central deflection. **(12.5)**

UNIT-IV

Q8 A composite shaft consists of a steel shaft of 100mm diameter encased in a closely fitting brass sleeve. Determine (i) the outside diameter of the sleeve if the torque applied to the composite shaft is to be shared equally by the two components and((ii) the maximum shearing stress in each material and angle of twist over a length of 3m, when the composite shaft transmits a torque of 25 KNm. Modulus of rigidity for brass and steel are 40 and 80 MPa respectively. **(12.5)**

Q9 A 8 metre long column is of circular section 50 mm internal and 60 mm external diameter and is fixed at one end while its upper end is free. Calculate the maximum load the column would be able to carry if its length is reduced to 1m. E=200GPa, crushing strength of material is 300MPa, Rankine constant = $\frac{1}{7500}$. **(12.5)**

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