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Total No. of Pages: 02
Total No. of Questions: 09

B.Tech (ME) (Sem.-3rd)
STRENGTH OF MATERIALS-I
Subject Code: BTME-301
Paper ID: [A1138]

Time: 3 Hrs.

Max. Marks: 60

INSTRUCTION TO CANDIDATES:

- 1) *Section-A is Compulsory.*
- 2) *Attempt any four questions from Section-B.*
- 3) *Attempt any two questions from Section-C.*

SECTION-A

(2x10=20)

Q.1. Write briefly:

- (a) What is a ductile material?
- (b) What is bulk modulus of a material?
- (c) What are compound stresses?
- (d) What is a fixed beam?
- (e) What is point of contraflexure?
- (f) Define section modulus.
- (g) What is a torque diagram?
- (h) Define equivalent bending moment.
- (i) Name different elastic constant.
- (j) Why are determinations of deflection is important?

SECTION-B

(5x4=20)

Q.2. Discuss stress-strain curve for ductile material.

Q.3. At a point in a material sample $\sigma_x = 50 \text{ M pa}$, $\sigma_y = 100 \text{ M pa}$ and $T_{xy} = -25 \text{ M pa}$. Determine the normal and shear stresses on a plane at 45° to the y axis.

Q.4. Derive the bending equation $\frac{M}{I} = \frac{\sigma}{Y} = \frac{E}{R}$, Where M, I E And R have usual meaning and σ is the stress at a distance y from the neutral axis.

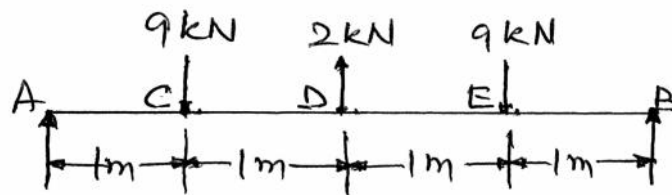
Q.5. What are the various step functions used in Macaulay's method? Discuss.

Q.6. A strut 3m long and 50mm diameter has its both ends i) pin joined ii) fixed calculate the safe buckling load, taking the factor of safety as 3 $E = 200 \text{ G pa}$.

SECTION-C

(10x2=20)

- Q.7. Draw the shear force and bending moment diagrams for the beam shown below.



- Q.8. The diameter ratio of a hollow shaft is 3:5 It is required to transmit 600 kw at 100 rpm. the maximum torque being 12% greater than the mean. If the twist in a length of 3m is not to exceed 1° and the shearing stress is limited to 60 MN/m^2 calculate the minimum external diameter of the shaft satisfying these condition Take $G = 80 \times 10^3 \text{ MN/m}^2$.
- Q.9. A hollow cast iron column with fixed ends supports an axial load of 1MN. If the column is 4.5m long and has an external diameter of 250 mm, find the thickness of metal required. Use the Rankine formula taking a constant of $1/6400$ for pinned ends and a working stress of 80 MN/m^2 .

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