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Total Pages : 05

013302

December 2024

B. Tech. (ME) (Third Semester)

Strength of Materials-1 (PCC-ME-302/21)

Time : 3 Hours] *[Maximum Marks : 75*

Note : It is compulsory to answer all the questions (1.5 marks each) of Part A in short. Answer any *four* questions from Part B in detail. Different sub-parts of a question are to be attempted adjacent to each other.

Part A

1. (a) Define the Poisson Ratio. **1.5**

   (b) Differentiate between proportional limit and elastic limit. **1.5**

   (c) What do you mean by flitched beam ? **1.5**

   (d) Draw the rough sketch of shear stress distribution curve for I-Section. **1.5**

   (e) Define the Castigliano's theorem deflection. **1.5**

(f) Define the Maxwell theorem for measurement of deflection of beam. 1.5

(g) Differentiate between thick and thin cylinder. 1.5

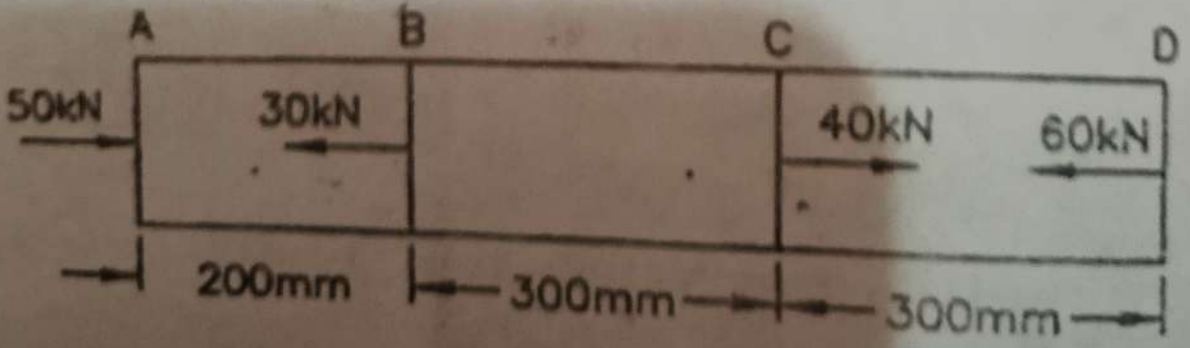
(h) Define the torsional rigidity. 1.5

(i) What is the difference between closed coil and open coiled helical spring ? 1.5

(j) State the Lami's theorem. 1.5

Part B

2. (a) A steel bar is subjected to loads as shown in figure below. If E for bar material = 200 kN/mm^2, determine the decrease in length of the bar ABCD. The bar is 200 mm in diameter. : 7



(b) At a point in a strained material the principal stresses are 200 N/mm^2 (tensile) and 120 N/mm^2 (compressive). Determine the following stresses on an oblique section inclined at 40 degree with the axis of minor principal stress : **8**

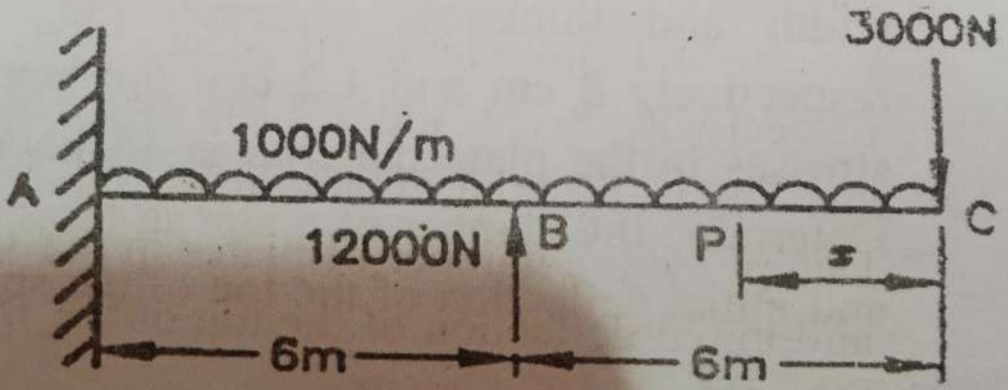
(i) Normal stress

(ii) Shear stress

(iii) Resultant stress

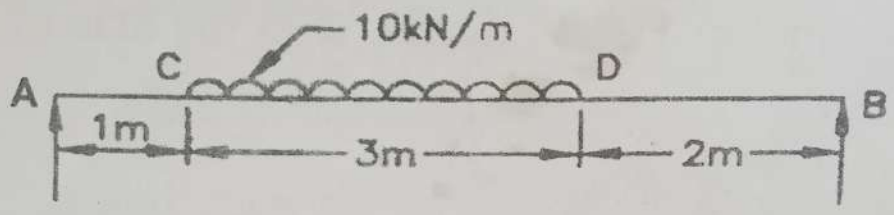
(iv) Maximum shear stress.

3. Draw the SFD and BMD for the figure given below and find the B.M at significant points : **15**



4. A simply supported beam is loaded with uniformly distributed load of 10 kN/m intensity as shown in figure below. If flexural rigidity EI = 45000 kN/mm^2, determine the central deflection and maximum deflection and location of its Occurrence.

15



5. (a) A solid shaft of 100 mm diameter is to be replaced by a hollow steel shaft of same material with internal diameter equal to the half of the external diameter. Design the hollow shaft and find out the percentage saving in materials if maximum allowable shear stress is the same for the both materials.

8

(b) A laminated leaf spring is to carry central load of 1 kN. The spring is 90 cm long and width and thickness of each plate are respectively 8 cm and 1.2 cm. the bending stresses in the plate material is 10 kN/cm^2. Determine the number of plates in the spring and initial deflection of the top of the spring. Take E= 2× 10^4 kN/cm^2.

7

6. (a) Prove that in a thin cylindrical shall subjected to internal fluid pressure, the circumferential stress is twice the longitudinal stress. 7

(b) A pipe has internal and external radii of 60 mm and 100 mm respectively. Pipe is subjected to internal fluid pressure of 120 bar. Make calculations for the radial stresses, hoop stresses and stress d difference at 8 cm radius. 8

7. (a) What do you mean by pure bending ? Derive the Bending equation with assumptions. 8

(b) When the shaft is said to be in pure Torsion ? Derive the torsion equation with assumptions. 7