Sr. No 013306

March 2022

B-Tech (ME) 3rd Sem

Strength of Materials (PCC-ME-203)

Time: 90 Minutes **Max. Marks:25**

Instructions:

1. *It is compulsory to answer all the questions (1 marks each) of Part -A in short.*
2. *Answer any three questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Assume a suitable value for any missing data.*

PART –A

Q1 (a) Write two equations used to find the forces in compound bars made of two materials subjected to tension. (1)

(b) What is uniformly distributed loads? (1)

(c) What are the assumptions made in the theory of bending? (1)

(d) Write down the equation for maximum shear stress of a solid circular section in diameter ' D ' when subjected to torque ' T' ? (1)

(e) Differentiate open coiled helical spring from the close coiled helical spring and state the type of shear induced in each spring due to an axial load. (1)

(f) What is meant by double integration method for deflection in beam? (1)

(g) What is the Mohr's circle? (1)

(h) Distinguish between cylindrical shell and spherical shell. (1)

(i) Define principal plane and principal stresses. (1)

(j) What is a shear center? (1)

PART –B

Q2 (a) Find the value of P and the change in length of each component and the total change in length of the bar shown in figure 1 below. (3)

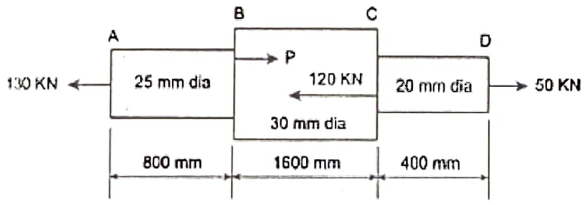

Figure 1

(b) Derive a relation for E, G and m (Poisson ration) as; E=2G(1+(1/m)). (2)

Q3 (a) For the simply supported beam loaded as shown in figure 2. Draw the shear force diagram and bending moment diagram. Also, obtain the maximum bending moment. (5)

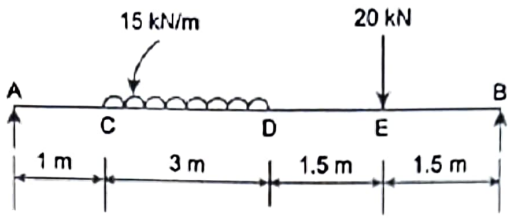

Figure 2

Q4 A beam is simply supported as its ends over a span of 10m and carries two concentrated of 100kN and 60kN at a distance of 2m and 5m respectively from the left support. Calculate (5)
i)slope and deflection at the left support;
ii) slope and deflection under the 100kN load. Assume EI=36X10⁴ kN-m²

Q5 (a) A close coil helical spring of round steel wire 10mm in diameter has a mean radius of 120mm. the spring has 10 complete turns and is subjected to a axial load of 200N. Determine (3)
i) Deflection of the spring.
ii) Maximum shear stress in the wire and.
iii) Stiffness of the spring. G=80kN/mm².

(b) A solid circular shaft is subjected to a torque of 150N-m. find the maximum diameter required if the allowable shear stress is 100N/mm² and allowable twist is 1° per 3m length of shaft. C=100KN/mm². (2)

Q6 (a) Derive an expression for Lame equation for thick cylinder. Discuss the assumption made. (2)

(b) A cylindrical shell 3m long which is closed at the ends, has an internal diameter of 1m and a wall thickness of 20mm. calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 2.0N/mm². Take E=2x10⁵N/mm² and 1/m=0.3. (3)

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