TED (21) -3021
(Revision- 2021)

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, NOVEMBER - 2023

STRENGTH OF MATERIALS

[Maximum Marks : 75] [Time : 3 hours]

PART–A

I. Answer **all** the following questions in one word or sentence. Each question carries 1 mark.

(9x1=9 marks)

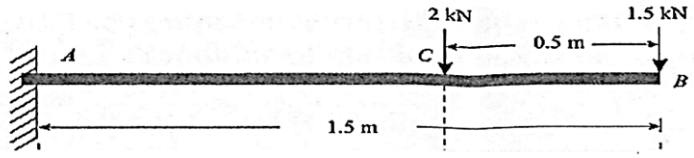
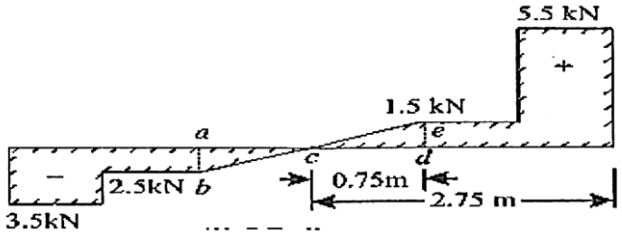
		Module Outcome	Cognitive level
1	How is strain related stress?	M1.01	U
2	Define Poisson's ratio.	M1.02	R
3	What is meant by overhanging beam?	M2.01	R
4	How is Shear force and Bending moment related?	M2.02	U
5	How is load of Uniformly Varying Load calculated? Show with the help of an example.	M2.01	U
6	What is the concept of Neutral layer?	M3.01	U
7	What is the importance of Slenderness ratio?	M3.05	U
8	What is stiffness of a spring?	M4.02	U
9	How is Hoop stress important for thin cylinders?	M4.03	U

PART B

II. Answer **any Eight** questions from the following. Each question carries 3 marks.

(8x3=24 marks)

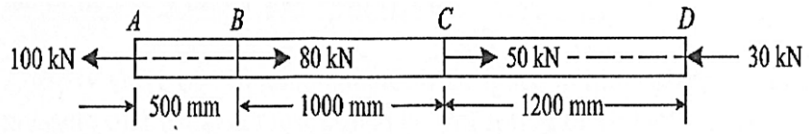
		Module Outcome	Cognitive level
1	A square steel rod 20 mm x 20 mm in section is to carry an axial load (compressive) of 100 kN. Calculate the shortening in a length of 50 mm. $E = 2.14 \times 10^8$ kN/m^2.	M1.01	U
2	The following observations were made during a tensile test on a mild steel specimen 40 mm in diameter and 200 mm long. Elongation with 40 kN load (within limit of proportionality), dl = 0.0304 mm: Yield load = 161 kN; Maximum load = 242 kN Length of specimen at fracture = 249 mm Determine the Percentage elongation of the specimen.	M1.02	A
3	Write about any 3 types of beams.	M2.01	R
4	Draw shear force diagrams for a cantilever beam of span 1.5 m carrying point loads as shown in Fig.	M2.03	U

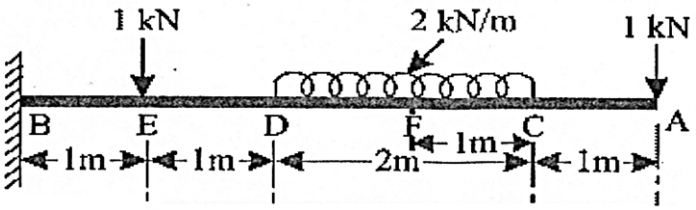
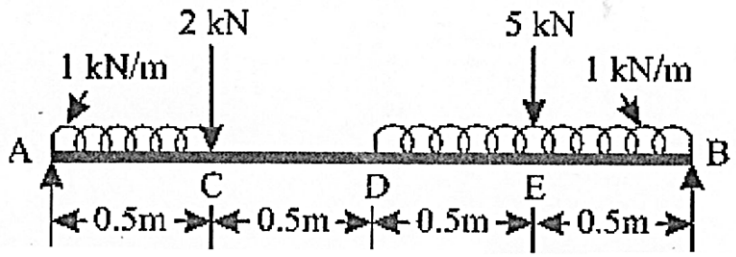
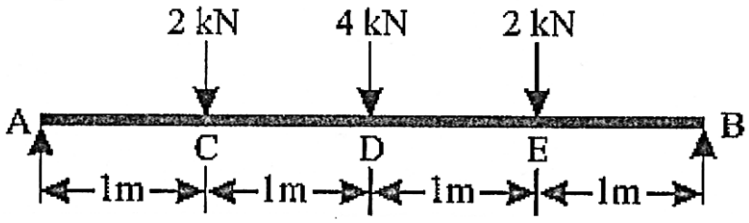
			
5	Given is the Shear force diagram of a simply supported beam. Draw the load condition on beam, based shear force diagram. 	M2.03	A
6	A timber beam of span 5m has moment of Inertia, $I=1.3x10^8$ mm^4. Find the magnitude of the central point load the beam carries if the maximum deflection of the beam is 5 mm.	M3.04	U
7	A steel column is of length 8 m and diameter 500 mm with both ends hinged. Determine the Buckling load by Eulers formula if $I = 3.07 \times 10^9$ mm^4.	M3.05	U
8	Explain (1) Closed coil helical spring (2) Open coil helical spring.	M4.02	R
9	Calculate the hoop stress of a thin cylinder of 3 m diameter and 30mm thickness subjected to an internal pressure of 1 N/mm^2.	M4.03	U
10	Write any 3 types of loads applied in beams.	M2.01	R

PART C

Answer **all** questions from the following. Each question carries 7 marks.

(6x7=42marks)

		Module Outcome	Cognitive level
III	A steel wire 2 m long and 3 mm in diameter is extended by 0.75mm when a weight W is suspended from the wire. If the same weight is suspended from a brass wire, 2.5 m long and 2mm in diameter, it is elongated by 4.64 mm. Determine the modulus of elasticity of brass if that of steel be $2.0 \times 10^5 N/mm^2$.	M 1.02	A
	OR		
IV	A brass bar, having cross-sectional area of 500 mm^2 is subjected to axial forces as shown in Fig. Determine the total extension. 	M1.03	A

V	A concrete column of cross-sectional area 400 mm x 400 mm is reinforced by four longitudinal 50 mm diameter round steel bars placed at each corner. If the column carries a comprehensive load of 300 kN, determine: (i) Loads carried; (ii) The compressive stress produced in the concrete and steel bars. Young's modulus of elasticity of steel is 15 times that of concrete.	M1.03	U
	OR		
VI	Draw the S.F. and B.M. diagrams for cantilever loaded as shown in Fig. 	M2.03	U
VII	Draw the B.M. and S.F. diagrams for the beam shown in Fig. 	M2.03	U
	OR		
VIII	Draw the S.F. and B.M. diagrams for simply supported beam loaded as shown in Fig. 	M2.03	U
IX	A 250 mm (depth) x 150 mm (width) rectangular beam is subjected to maximum bending moment of 750 kNm. Determine: (i) The maximum stress in the beam. (ii) If the value of E for the beam material is 200 GN/m^2, find out the radius of curvature for that portion of the beam where the bending is maximum. (iii) The value of the longitudinal stress at a distance of 65 mm from the top surface of the beam.	M3.03	U
	OR		
X	Write the assumptions on Euler's theory of columns.	M3.05	R

XI	Calculate the safe compressive load on a hollow cast iron column (one end rigidly fixed and the other hinged) of 150 mm external diameter, 100 mm internal diameter and 10 m length. Use Euler's formula with a factor of safety of 5, and $E = 95\ GN/m^2$.	M3.05	R
	OR		
XII	A safety valve of 120 mm diameter is designed to blow off at a gauge pressure of 1 MPa. A close coiled helical spring of 160mm mean diameter is used to hold the valve in position. Determine the diameter of the coils of the spring and the number of turns requires if the initial compression of the spring is 60 mm and maximum value of shear stress is 70 MPa. Take G = 84 GPa.	M4.02	U
XIII	Calculate the minimum wall thickness of the thin cylinder 1 m in diameter if subjected to an internal pressure of 2 N/mm^2. The hoop stress should not exceed 40 N/mm^2 and the longitudinal stress not to exceed 30 N/mm^2.	M4.03	R
	OR		
XIV	Derivation of the Torsion equation $T/J = fs/R = G\theta/L$	M4.01	R

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