TED (21) -3021
(Revision- 2021)

N22-2110220178A

Reg.No.....
Signature. .....

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE – NOVEMBER - 2022

STRENGTH OF MATERIAL

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

PART–A

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

(9x1=9 marks)

		Module Outcome	Cognitive level
1	The unit of strain is.....	M1.01	R
2	The ability of a material to be drawn into wires is called.....	M1.01	R
3	The ratio of tensile stress to tensile strain is termed as.....	M1.02	R
4	A beam in which the ends extend beyond its supports is called.....	M2.01	R
5	A beam is having positive bending moment at.....condition.	M2.02	U
6	The ratio $\frac{I}{y}$ in the case of beam is called.....	M3.01	R
7	A slender bar or a member in any position other than vertical is called.....	M3.05	R
8	Write down the equation for power transmitted by the shaft.	M4.01	R
9	Vessels used for storing fluid under pressure are called.....	M4.03	R

PART - B

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

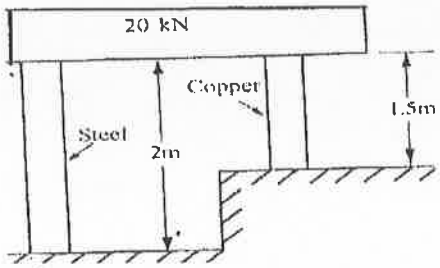
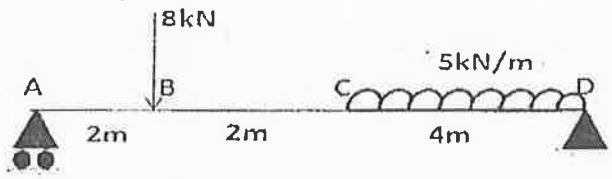
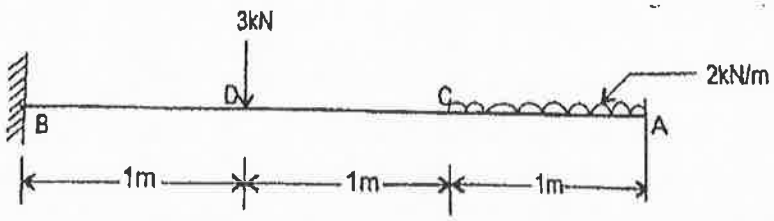
(8x3=24marks)

		Module Outcome	Cognitive level
1	Define shear stress and shear strain .	M 1.01	R
2	Define 1. Poisson's ratio. 2. Bulk modulus.	M 1.02	R
3	Explain 1. Ultimate stress 2. Factor of safety.	M1.02	U
4	A steel bar 2m long and 200 mm^2 section is subjected to an axial pull of 20 kN. Find the elongation of the bar. Take E = 200 GPa.	M1.05	U
5	Explain different types of loads in beams with neat sketches.	M2.01	U
6	Define shear force and bending moment.	M2.02	R
7	Draw the bending diagram of a cantilever beam of length L with a point load W at its end.	M2.03	U
8	List the assumptions in theory of bending.	M3.01	R
9	Define 1. Spring index 2. Stiffness of the spring.	M4.01	R
10	Define thin cylinder. Explain the failures in thin cylinder.	M4.03	U

PART - C

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

(6x7=42marks)

		Module Outcome	Cognitive level
III	A steel road together with a copper rod support a load of 20 kN as shown in figure. The diameter of each rod is 20 mm. Find the stresses in each rod. Take E for steel as 2.05×10^5 N/mm^2 and E for copper as 1.1×10^5 N/mm^2.  **OR**	M1.02	U
IV	A rod of steel is 20 meter long at a temperature of 20°C. Find the free expansion of the rod when the temperature is raised to 65°C. Find the temperature stress produced (i) when the expansion of the rod is prevented (ii) when the rod is permitted to expand by 5.8mm. Take $\alpha = 12 \times 10^{-6}$ per °C and E = 2×10^5 N/mm^2.	M1.05	U
V	Draw shear force and bending moment diagram for the beam as shown in figure below.  **OR**	M2.03	A
VI	Draw shear force and bending moment diagram for the beam as shown in figure below.  	M2.03	A

VII	A rectangular beam 80 mm x 80 mm is 3 m long and simply supported at its ends. It carries a load of 2 kN at the mid span. Determine the maximum bending stress induced in the beam.	M3.03	U
	OR		
VIII	A timber beam of rectangular section 100 mm wide and 250 mm deep, supports over a span of 5 m. It carries a point load of 3 kN at the centre of the beam. Find the maximum deflection. Take $E = 1x10^4$ N/mm^2.	M3.04	U
IX	Derive bending equation $\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$	M3.02	U
	OR		
X	Find the crippling load by Rankine's formula for a hollow cylindrical steel column, fixed at both the ends having 38 mm external diameter and 2.5 mm thick. The length of the column is 2.3 m. Assume crushing stress of the column material as 335 Mpa and Rankine's constant 1/7500.	M3.05	A
XI	Derive torsion equation $\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{L}$	M4.01	U
	OR		
XII	Calculate the minimum wall thickness of a 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 should not exceed 30 N/mm^2.	M4.03	U
XIII	A closely coiled helical spring is made of 6 mm wire. The maximum shear stress and deflection under a 200 N load is not to exceed 80 MPa and 11 mm respectively. Determine the number of coils. Take modulus rigidity of the spring material as 84 MPa.	M4.02	U
	OR		
XIV	A hollow shaft is to transmit 200 kW at 80 rpm. If the shear stress is not to exceed 60 MPa and internal diameter is 0.6 of the external diameter, find the diameter of the shaft.	M4.01	U

****