Q. Code: 323454

Reg. No. | | | | | | | | | | | | | |

B.E / B.TECH. DEGREE EXAMINATION, MAY 2023

Fourth Semester

MR18401 –STRENGTH OF MATERIALS FOR MARINE ENGINEERING

(Marine Engineering)

(Regulation 2018/2018A)

TIME: 3 HOURS **MAX. MARKS: 100**

CO 1 Students will be able to identify the behavior of the materials for simple loads.
CO 2 Students will be able to analyze and design the beam based on shear force, bending moments, and various stresses.
CO 3 Students will be able to design the beam based on various stresses to design the cross section of the beam based on loading conditions.
CO 4 Students will be able to select the methodology to calculate the deflection in Beams and design the shafts and spring.
CO 5 Students will be able to design the Columns and Pressure vessels.

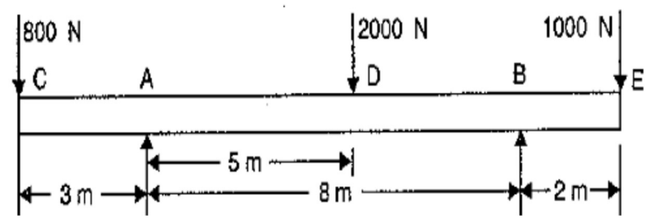
PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	How will you apply the principle of superposition in a stepped bar?	**1**	**2**
2.	Compare tensile and compressive stress.	**1**	**2**
3.	How will you determine the maximum bending moment in a simply supported beam?	**2**	**2**
4.	What do you understand by the term, 'point of contraflexure?	**2**	**2**
5.	Draw the shear stress distribution diagram of a beam with a rectangular cross-section.	**3**	**2**
6.	Define and determine the section modulus value of a hollow circular section of outer diameter 100 mm and inner diameter 75 mm.	**3**	**2**
7.	List out the methods available to find the slope and deflection.	**4**	**1**
8.	Justify why hollow circular shafts are usually preferred over solid circular shafts.	**4**	**2**
9.	What is the critical load of a column of 50 mm circular cross-section, 2 m long, and fixed at ends? Take E = 200kN/mm^2	**5**	**2**
10.	Differentiate the thin and thick cylinder.	**5**	**2**

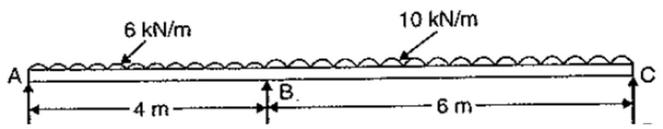
PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11. (a)	Tensile test is carried out on a mild steel bar of 10mm diameter and with 50mm gauge length. The bar yields under the load of 20kN it reaches a maximum load of 40kN and breaks at 25 kN. Estimate 1.yield strength 2.ultimate strength 3.breaking strength 4.Actual breaking strength if dia of neck is 7mm 5.% of reduction in area 6.% of elongation if final gauge length is 67mm.	**(14)**	**1**	**3**
	(OR)			
(b)	A steel rod of 20 mm diameter passes centrally through a copper tube of external diameter 50 mm and internal diameter 40 mm. The assembly is tightened with the help of washers and nuts. If the temperature of the assembly is raised by 50°C, then find the stresses developed in the steel rod and copper tube. Assume: Young's modulus for steel =2 x10^5 N/mm^2 Young's modulus for copper =1 x10^5 N/mm^2 Coefficient of expansion for steel =12 x 10^{-6}/°C Coefficient of expansion for copper =18 x 10^{-6}/°C.	**(14)**	**1**	**3**
12. (a)	Draw the SFD and BMD for the given overhanging beam and locate point of contra flexure	**(14)**	**2**	**3**



(OR)

(b) A continuous beam ABC is loaded as shown in the figure. Find the support moments over the beam and draw the shear force and bending moment diagram. **(14) 2 3**



13. (a) Derive the expression for the pure bending and also write down any four-assumption made to derive the expression for pure bending. **(14) 3 3**

(OR)

(b) At a point within a body subjected to two mutually perpendicular directions, the stresses are 80 N/mm^2 tensile and 400 N/mm^2 tensile. Each of the above stresses is accompanied by a shear stress of 60 N/mm^2.Determine the normal stress, tangential stress and resultant stress on an oblique plane inclined at an angle of 45^0 with the axis of minor tensile stress. **(14) 3 3**

14. (a) A beam of length 6 m is simply supported at its ends and carries two-point loads of 48 kN and 40 kN at a distance of 1 m and 3 m respectively from the left support. Find: **(14) 4 3**

(i) deflection under each load,

(ii) maximum deflection, and,

(iii) the point at which maximum deflection occurs.

Take $E=2x10^5$ N/mm^2 and Moment of inertia $I=85x10^6$ mm^4

(OR)

(b) (i) Derive the expression for the torsion equation and write down the assumption made. **(8) 4 3**

(ii) A closed coiled helical spring of round steel wire 10mm in diameter having 15 complete turns with a mean coil diameter of 100 mm is subjected to an axial load of 100N.Determine the i) maximum shear stress in the wire ii) Deflection of the spring iii) stiffness of the spring. Take $C=8.16$ $X10^4$ N/mm^2 **(6)**

15. (a) A hollow C.I column whose outside diameter is 38 mm has a thickness of 2.5 mm.It is 2.3m long and is hinged at both ends. **(14) 5 3**

Calculate

1. Euler's cripping Load
2. Cripping load by Rankin's formula using constants as σ_c=335 N/mm^2, a=(1/7500)

3.Ratio of Euler's and Rankine's critical loads.

Take $E=2.05 \times 10^5$ N/mm^2

(OR)

(b) A cylindrical vessel is 1.5m diameter and 4m long is closed at ends by rigid plates. It is subjected to an internal pressure of 3N/mm^2. If the maximum principal stress is not to exceed 150 N/ mm^2, find the thickness of the shell. Assume E = 2 X 10^5 N /mm^2 and poisson's ratio = 0.25. Find the changes in diameter, length and volume of the shell. **(14) 5 3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	By using the double integration method find the slope and deflection of the simply supported beam with point load at the centre.	**(10)**	**4**	**3**

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