M-304 STRENGTH OF MATERIALS

Blue Print of Model Question Paper

S. No	Chapter Name	Periods Allocated	Weightage Allocated	Question Wise Distribution of Weightage			Question Wise Distribution of Marks		
				R	U	Ap	R	U	Ap
1	Simple Stresses Stresses and Strains	12	19	01	02	1	03	06	10
2	Strain energy	8	13	01	-	1	03	-	10
3	Shear Force and Bending Moment	16	26	01	01	2	03	03	20
4	Theory of Simple Bending & Deflection of Beams	12	26	01	01	2	03	03	20
5	Torsion in Shafts and Springs	12	26	01	01	2	03	03	20
TOTAL		**60**	**110**	**05**	**05**	**08**	**15**	**15**	**80**

R-Remembering; U-Understanding; Ap-Applying; An- Analylising

Unit Test - 1

Q.No	Question from the Chapter	Bloom's category	Marks allocated	CO addressed
Part - A (16 marks)				
1	Simple Stresses & Strains, Strain Energy, Shear Force & Bending Moment	R,U	4	CO1,CO2,CO3
2,3	Simple Stresses & Strains	U	6	CO1
4	Strain Energy	U	3	CO2
5	Shear Force & Bending Moment	U	3	CO3
Part - B (24 marks)				
6	Simple Stresses & Strains	Ap	8	CO1
7	Strain Energy	Ap	8	CO2
8	Shear Force & Bending Moment	Ap	8	CO3

Unit Test - 2

Q.No	Question from the topic	Bloom's category	Marks allocated	CO addressed
Part - A (16 marks)				
1	Theory of Simple Bending & Deflections of Beams,	R,U	4	CO4,CO5
2,3	Theory of Simple Bending & Deflections of Beams	U	6	CO4
4,5	Torsion in Shafts & Springs	U	6	CO5
Part - B (24 marks)				
6	Theory of Simple Bending & Deflections of Beams	Ap	8	CO4
7,8	Torsion in Shafts & Springs	Ap	16	CO5

R-Remembering; U-Understanding; Ap-Applying; An- Analylising

BOARD DIPLOMA EXAMINATION(C-23)
DME – III SEMESTER, UNIT TEST-I
M-304, STRENGTH OF MATERIALS

Time: 90Min. Total marks: 40

PART-A : Instructions: Answer ALL questions.
In Question no.1, each question carries one mark
From Question no. 2 to 5 carries three marks each

1. a) Define Stress.
   b) The ratio between ultimate stress and Design stress is called _____.
   c) The strain energy stored with in elastic limit is called_____
   d) Define shear force.
2. List out the three elastic constants and write down the relationbetween them
3. A MS bar carries an axial load of 75 kN. If the allowable tensile stress is 50 N/mm^2, find the diameter of the rod.
4. Calculate the proof resilience and modulus of resilience due to extension of steel bar 20 mm diameter and 1500 mm length. The stress induced in elastic limit and modulus of elasticity for steelbar is 250 N/mm^2 and 200 GN/m^2 respectively.
5. Draw shear force diagram for a simply supported beam of length 6 m and carries a point load of 40 kN at adistance of 1·75 m from left end support.

PART-B

Instructions: Part B consists of 3Questions. Each question carries 8 marks

6. Draw the stress – strain diagram for ductile material subjected to tensile force.

   (OR)

   A bar of length 3 m has a diameter of 50 mm over half its length and a diameter of 25 mm over the other half. If E= 2.06 x 10^5 N/mm^2 and the baris subjected to a pull of 50 kN. Find the stress in each section and total extension of the bar.

7. A MS bar of length 2 m has a diameter of 50 mm, hangs vertically.A load of 20 kN falls on a collar attached to the lower end. Find the maximum stress when *(a)* height of fall is 100 mm, *(b)* load is applied suddenly without impact, and *(c)* when load is applied gradually. Take E=2X$10^5$$N/mm^2$.

   (OR)

A mild steel specimen of 20mm diameter extends mm over a 50mm gauge length under an axial load of 32KN. (a) Calculate the strain energy at this point and (b) If the load at elastic limit is 55KN, calculate the proof resilience.

8. A 6 m long cantilever beam carries loads of 2 kN and 3 kN at 2 m and 5 m respectively from fixed end and uniform distributed load of 10 kN/m over its entire length. Draw S.F and B.M diagram for the beam.

(OR)

A beam of length 1.2m is simply supported at its ends and carries two pint loads of 3.5KN and 4Kn at distances of 0.4m and 0.8m from the left end support. Draw the Shear force diagram and bending moment diagram.

BOARD DIPLOMA EXAMINATION(C-23)
DME – III SEMESTER, UNIT TEST-II
M-304, STRENGTH OF MATERIALS

Time: 90Min. Total marks: 40

PART-A : Instructions: Answer ALL questions.
In Question no.1, each question carries one mark
From Question no. 2 to 5 carries three marks each

1. a) State simple bending equation with usual notations.
   b) Write the expression for slope on simply-supported beam with UDL over the entire beam
   c) Write the formula for polar moment of inertia of a hollow shaft.
   d) Define a spring.
2. State any three assumptions made in theory of simple bending.
3. A cantilever beam of length 6m is carrying a uniform distributed load of 16KN-m. Calculate the deflection at the free end of the beam. Take moment of inertia= $95X10^7 mm^4$ and $E=2X10^5 N/mm^2$
4. Define polar modulus and write the equations for solid and hollowshafts.
5. List out the various types of springs.

PART-B

Instructions: Part B consists of 3Questions. Each question carries 8 marks

6. A rectangular beam 300 mm deep is simply supported over a span of 4 meters. What uniformly distributed load per meter the beam may carry if thebending stress is not to exceed 120 N/mm^2. Take I = $8x10^6 mm^4$.

(OR)

A Cantilever beam of length 2m is subjected to a UDL of intensity 1000N/m throughout its length. Find the maximum bending stress in the beam if the cross section of the beam is rectangle with dimensions 80mmX40mm.

7. A ship propeller shaft is to transmit 500 MW at 2 rev/sec. The shaftpermissible stress is limited to 60 N/mm^2 and the maximum torque being 1·3 times the mean torque. Determine (a) required diameter of the solid shaft.

(OR)

A solid steel shaft 100 mm diameter transmits 75 kW at 150 rpm. Calculate *(a)* Torque on the shaft ; *(b)* The maximum shear stress induced ; *(c)* The angle of twist in a length of 600 mm and *(d)* The shear stress at a radius of 30 mm. Take $G = 08 \times 10^5$ N/mm^2.

8 A hollow shaft is to transmit 300 kW at 90 rpm. If the shear stress mustnot exceed 60 N/mm^2, find the external and internal diameters of shaft. Assume that the maximum torque is 20 % greater than the mean torqueand internal diameter is 0.6 times of the external diameter.

(OR)

A close coiled spring is to have stiffness of 1 N/mm of compressionunder maximum load of 45 N and maximum shearing stress of 120 N/mm^2. The solid length of wire is to be 45 mm. Find the diameter of wire, the mean diameter of coils and number of coils required.

MODEL PAPER
DME– III SEMESTER END EXAMINATION
STRENGTH OF MATERIALS

Time : 3 hours Max Marks : 80

Part – A 3M X 10 = 30M

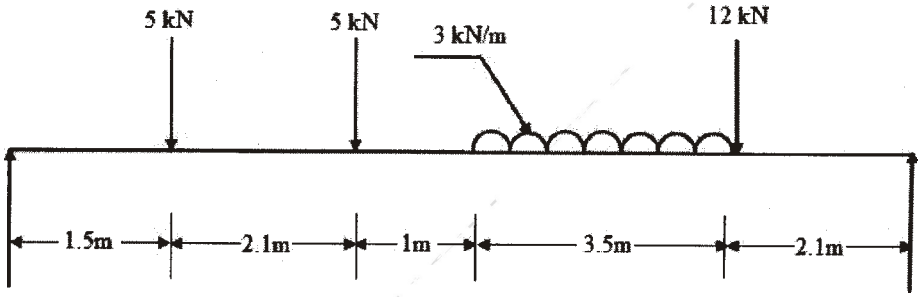
Instructions : 1) Answer ***all*** questions
2) Each question carries ***three*** marks
3) Answer should be brief and straight to the point and shall not exceed five simple sentences.

19. Define the following terms :
    i. Poisson's ratio
    ii. Modulus of elasticity
    iii. Modulus of rigidity
2. A load of 4000 N has to be raised at the end of a steel wire. If the unit stress in the wire must not exceed 80 N/mm^2, what is the minimum diameter required? What will be the extension of 3·5 m length of wire? Take $E = 2 \times 10^5$ N/mm^2.
3. Define Factor of safety. Significance of Factor of Safety.
4. A bar of 35 mm diameter and 2 m long is subjected to a suddenload of 50 kN. Calculate the maximum instantaneous stress and strain energy in the bar. Asssume $E = 2 \times 10^5$ N/mm^2.
5. List any three types of beams.
6. Draw the shear force diagram for a simply supported beam subjected to a uniform distributed load throughout its length.
7. Write the bending equation and mention the units of the terms.
8. A cantilever beam 2.5 m carries a point load of 30 KN at free end. Find the slope and deflection of the beam at the free end. Assume I = 8 x 10^7 mm^4. E=2.1 x 10^5 N/mm^2.Mention desirable properties of an insulating materials.
9. Find the maximum torque transmitted by a solid shaft of diameter 30 cm, if the shear stress is not to exceed 40 N/mm^2.
10. Define the terms spring index and stiffness related to coiled helical springs

Part – B 10M X 5 = 50M

Instructions : 1) Answer any ***five*** questions
2) Each question carries ***ten*** marks
3) Answer should be comprehensive and criteria for valuation is content, but not the length of the answer.

11. Draw a stress-strain diagram for MS specimen and discuss the significance of salient points on it.
12. An MS bar of length 2 m has a diameter of 50 mm, hangs vertically. A load of 20 KN falls on a collar attached to the lower end. Find the maximum stress when *(a)* height of fall is 100 mm, *(b)* load is applied suddenly without impact and *(c)* load is applied gradually. Take $E = 2 \times 10^5$ N/mm^2.
13. A 6 m long cantilever beam carries loads of 2 kN and 3 kN at 2 m and 5 m respectively from fixed end and u.d.l of 10 kN/m over its entire length. Draw S.F and B.M diagram for the beam.
14. Draw SF and BM diagrams for the beam loaded as shown in figure below. All loads are in kN and length are in metre:



15. A simply supported timber beam of rectangular cross section is to be support as a load of 25 kN uniformly distributed over a span of 3·6 m. If the depth of the section is to be twice the breadth, and the stress in timber is not exceed 7 N/mm^2, find the dimensions of the cross section.

16. (a) A timber beam, 150 mm x 300 mm cross section supports a central point load on a span of 4 m. If the maximum bending stress is 8N/mm^2, what is the maximum deflection? Take E= 0.1 x 10^5 N/mm^2.
(b) A cantilever 1.25 m long of section 100 mm wide x 160 mm deep carries a concentrated load of 60 kN at free end. Find the deflection at free end. Take E= 2.1 x 10^5 N/mm^2
17. A hollow shaft is to transmit 300 kW at 90 rpm. If the shear stress mustnot exceed 60 N/mm^2, find the external and internal diameters of shaft. Assume that the maximum torque is 20 % greater than the mean torqueand internal diameter is 0.6 times of the external diameter.
18. A closely coiled helical spring made of 10 mm diameter steel wire has 15 coils of 100 mm mean diameter. The spring is subjected toan axial load of 150 N. Calculate *(a)* the maximum shear stress induced, *(b)* the deflection and *(c)* stiffness of the spring. Take $G = 8 \times 10^4$ N/mm^2.