PREVIOUS YEAR QUESTION PAPERS

Q.P Code: CE2102PC Hall Ticket No.:

NARSIMHAREDDY ENGINEERING COLLEGE
(UGC AUTONOMOUS)

II B.Tech I Semester (NR21) Supplementary Examination, July 2024

STRENGTH OF MATERIALS – I

(Civil Engineering)

Time : 3 hours **Maximum marks: 70**

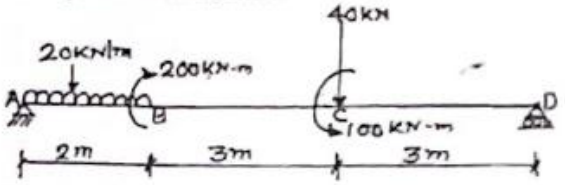
Note:
- This question paper contains two parts, A and B
- Part A is compulsory which carries 20 marks (10 sub questions are two from each unit carry 2 Marks). Answer all questions in Part A
- Part B Consists of 5 Units. Answer one question from each unit. Each question carries 10 Marks and may have a, b sub questions

Part-A **(20 Marks)**
Answer all questions

Q.No		Question	M	CO	BL
1)	a.	What are the general assumptions made in stress and strain	2	CO1	L2
	b.	What is meant by strain energy	2	CO1	L1
	c.	Define bending moment at a section of a beam.	2	CO2	L2
	d.	State the relationship between shear force and bending moment.	2	CO2	L2
	e.	Write the theory of simple bending equation	2	CO3	L2
	f.	Define (i) shear stress distribution (ii) section modulus.	2	CO3	L1
	g.	Illustrate what is meant by deflection of beam with neat sketch	2	CO4	L2
	h.	Write the maximum value of deflection for a cantilever beam of length L, constant EI and carrying concentrated load W at the end.	2	CO4	L4
	i.	Define principal planes and principal stress	2	CO5	L2
	j.	State the Limitations of Maximum principal stress theory	2	CO5	L2

Part-B **(50 Marks)**
Answer all the Units
All Questions carry equal Marks

Q.No		Question	M	CO	BL
		UNIT–I			
2)		Explain stress-strain curve for mild steel specimen in tension with a neat sketch. Mark the salient Points in it	10	CO1	L2
		OR			
3)		Derive an expression for the strain energy due to bending for a simply supported beam of span 'L' carrying uniformly distributed load of 'w' per unit run over the entire span. The beam is of uniform cross section and constant flexural rigidity. Also determine the magnitude of strain energy if beam length L = 6 m, load intensity w = 10 kN/m, Young's modulus = 200 GPa and moment of inertia I = 1500 cm^4	10	CO1	L3

	UNIT–II			
4)	Draw the shear force and bending moment diagram for the beam shown in Fig. Determine the point of maximum bending moment and also locate points of contra flexure  	10	CO2	L4
	OR			
5)	A simply supported beam has a span of 5m and carries a UDL load of 20kN/m in the left half and a UDL of 40 kN/m in the right half of its length. It also carries a point load of 30KN at the centre of the beam. Draw the SFD and BMD and find the position and magnitude of maximum BM in the beam.	10	CO2	L4
	UNIT–III			
6)	Derive an equation for pure bending $\frac{M}{I} = \frac{f}{Y} = \frac{E}{R}$ with usual notation.	10	CO3	L4
	OR			
7)	The cross section of T beam is as follows: Flange thickness = 10mm; width of the flange = 100mm; thickness of the web = 10mm; depth of the web = 120mm, If a shear force of 2kN is acting at a particular section of the beam design and draw the shear stress distribution across the section	10	CO3	L5
	UNIT–IV			
8)	A beam of length 6 m is simply supported at its ends and carries two point loads of 45 kN and 30 kN at a distance of 1.2 m and 3.2 m respectively from the left support. Solve for (i) Deflection under each load (ii) Maximum deflection (iii) The point at which the maximum deflection occurs. Take $I=85\times10^6$ mm^4 $E = 2\times10^5$ N/mm^2	10	CO4	L5
	OR			
9)	Define slope, deflection and elastic curve. Explain Macauly's method of determining slope and deflection.	10	CO4	L3
	UNIT–V			
10)	A bolt carries an axial load of 8 kN together with a transverse shear of 3 KN. Determine the diameter of the bolt required according to i) maximum principal stress theory ii) maximum shearing stress theory iii) strain energy theory iv) maximum strain theory. Take elastic limit in tension is 270 N/mm^2 and factor of safety of 3 is to be applied. Take poissons ratio = 0.3.	10	CO5	L4
	OR			
11)	Discuss in detail about various theories of failures	10	CO5	L2

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Code No: 153BU

R18

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech II Year I Semester Examinations, April/May - 2023
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	What are the practical applications of impact loads?	[2]
b)	Define the following terms: i) Elasticity and Plasticity ii) factor of safety iii) Lateral and longitudinal strains.	[3]
c)	Explain the different types of loads with diagrams.	[2]
d)	Define the terms shear force and bending moment.	[3]
e)	Define bending and shear stress.	[2]
f)	Discuss the assumptions made in theory of simple bending.	[3]
g)	What are the factors affecting deflection?	[2]
h)	Give the difference between a real beam and a conjugate beam.	[3]
i)	List the methods to find the stresses in oblique plane.	[2]
j)	Give the differences between Strain Energy and Shear Strain Energy Theory.	[3]

PART – B

(50 Marks)

2.a) Derive the expression for the elongation for the circular tapered bar.
b) A metallic rod of 1 cm diameter, when tested under an axial pull of 10 kN was found to reduce its diameter by 0.0003 cm. The modulus of rigidity for the rod is 51 KN/mm^2. Find the Poisson's ratio, modulus of elasticity and Bulk Modulus. [4+6]

OR

3.a) Write the differences among Gradual, Sudden, Impact and Shock loadings with the help of expressions.
b) Determine the young's modulus and Possion's ratio of a metallic bar of length 25cm, breadth 3cm depth 2cm when the beam is subjected to an axial compressive load of 240 KN. The decrease in length is given by 0.05cm and increase in breadth 0.002 cm. [4+6]

4.a) Define beam. Sketch different types of beams indicating their names.
b) A beam of length l carries a uniformly distributed load of w per unit length. The beam is supported on two supports at equal distances from the two ends. Determine the position of the supports, if the B.M, to which the beam is subjected to, is as small as possible. [4+6]

OR

5.a) Draw the shear force and bending moment diagram for a simply supported beam AB of span 9 meters carrying a uniformly distributed load of 18 KN per meter for a distance of 4 meters from the left support A.

b) A horizontal beam of 10m long is carrying a uniformly distributed load of 1kN/m. The beam is supported on two supports 6m apart. Find the position of supports, so that bending moment on the beam is as small as possible. [5+5]

6.a) Define section modulus. Write the units for section modulus. Derive the section modulus for hollow circular cross section.

b) A beam of cross – section of an isosceles triangle is subjected to a shear force of 45 KN at a section where base width = 125 mm and height = 400 mm. Determine the horizontal shear stress at the neutral axis. [4+6]

OR

7.a) Derive the formula for shear stress at a section.

b) A cantilever beam of length 10 m has a cross section of 100 mm × 130 mm has a UDL of 10KN/m over a length of 8 m from the fixed support and a concentrated load of 10 KN at the free end. Find the maximum bending stress in the beam. [3+7]

8.a) A hollow shaft of external diameter 120 mm transmits 300 kW power at 200 r.p.m. Determine the maximum internal diameter if the maximum stress in the shaft is not exceeded 60 N/mm^2.

b) A simply supported beam of 8m carries a partial u d l of intensity 5KN/m over a length of 2m, starting at 2m from the left end. Find slope at left support and central deflection. Take E = 200Gpa and $I = 8\times10^8 mm^4$. [5+5]

OR

9.a) Define Macaulay's Method. Discuss procedure to solve the problem by Macaulay's method.

b) A beam section is 10m long and is simply supported at ends. It carries concentrated loads of 100kN and 60kN at a distance of 2m and 5m respectively from the left end. Calculate the deflection under the each load find also the maximum deflection. Take $I = 18 \times 10^8 mm^4$ and $E = 200kN/mm^2$. [3+7]

10.a) Explain about procedure for graphical at solution of Mohr's circle of stresses.

b) Two planes AB and AC which are right angles carry shear stress of intensity 17.5 N/mm^2 while these planes also carry a tensile stress of 70 N/mm^2 and a compressive stress of 35 N/mm^2 respectively. Determine the principal planes and the principal stresses. [3+7]

OR

11.a) Explain in detail about Maximum Principal Stress Theory.

b) At a point in a strained material the principal stresses are 100 N/ mm^2 (tensile) and 60 N/mm^2 (compressive). Determine the normal stress, shear stress and resultant stress on a plane inclined at 50^0 to the axis of major principal stress. [3+7]

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Code No: 153BU

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, August/September -2022
STRENGTH OF MATERIALS – I
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) The Modulus of rigidity for a material is 0.81×10^5 MPa. A 10 mm diameter rod was subjected to an axial pull of 10 kN and the change in diameter was observed to be 3×10^{-3} mm. Calculate Poisson's ratio and the modulus of elasticity.

b) Deduce the total extension of a uniformly tapering rod of diameters d and D over a length of L, when the rod is subjected to an axial load 'P'. [9+6]

2. Determine the values and draw the shear force and bending moment diagrams for the loaded over hanging beam shown in figure 1. [15]

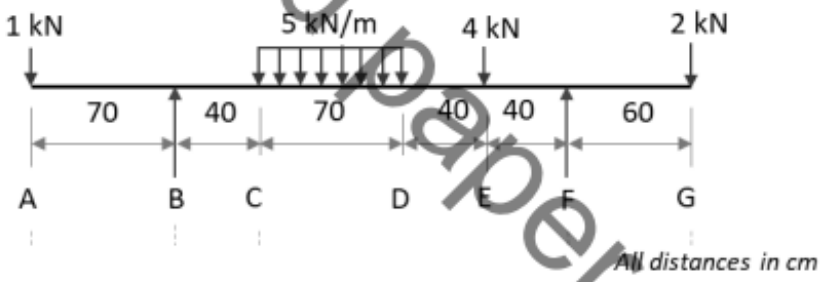

Figure 1

3.a) A beam of I section 400 mm × 200 mm has a web and flange thickness 20 mm. Calculate the maximum intensity of shear stress across the section and sketch the shear stress distribution across the section of the beam, if it carries a shearing force of 300 kN at a section.

b) A rectangular beam 200 mm deep is simply supported over a span of 6 m. Determine the uniformly distributed load per meter which the beam may carry, if bending stress should not exceed 100 N/mm^2. Take I=8.0×10^6mm^4. [8+7]

4.a) Determine the slope at supports and deflection at points B and C by Macaulay's method shown in figure 2.

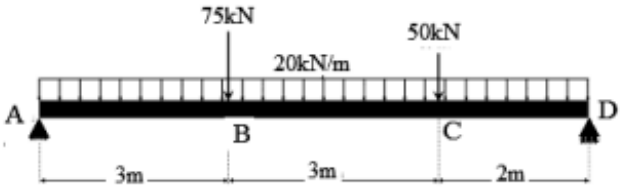

Figure 2

b) What is the difference between real beam and conjugate beam? [12+3]

5.a) Write and explain the assumptions made in the theory of simple bending.

b) Find the section modulus for a hollow circular section of internal diameter d and external diameter D.

c) Prove that the ratio of depth to width of the strongest beams that can be cut from a circular log of diameter, d is 1.414. [5+5+5]

6.a) At a point in a strained material, the principal stresses are 100 MN/m^2 (tensile) and 40 MN/m^2 (compressive). Determine the resultant stress in magnitude and direction on a plane inclined at 60^0 to the axis of major Principal stress. What is the resultant stress and maximum intensity of shear stress in the material at a point?

b) The Principal stresses at a point in an elastic material are 200N/mm^2 (tensile), 100N/mm^2 (tensile) and 50N/mm^2 (compressive). If the stress at the elastic limit in simple tension is 200N/mm^2. Determine whether the failure of the material will occur according to the maximum principal strain theory. Take Poisson's ratio = 0.3. [10+5]

7. A cantilever beam of length 7m carries a gradually varying load, zero at the free end to 5 kN/m at the fixed end. Draw the S.F and B.M diagrams for the cantilever. [15]

8. A horizontal beam of the section is shown in Figure 3, is 3.0m long and is simply supported at the ends. It carries an udl of intensity 6.56 kN/m over the entire span. Determine the stresses developed in the extreme fibers of compression and tension zones. **(All dimensions are in mm)**. [15]

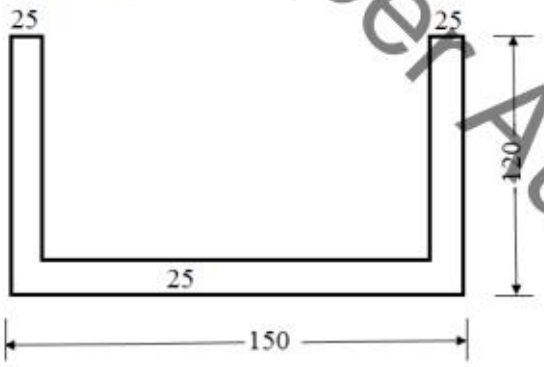

Figure 3

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Code No: 153BU

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2022
STRENGTH OF MATERIALS – I
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks
- - -

1.a) Derive the relation between the three elastic modulii(E,G and K).
b) Explain the Strain Energy and deduce the expressions due to gradual and suddenly applied loading. [7+8]

2.a) Draw the shear force and bending moment diagrams for the simply supported beam as shown in Figure 1. Also calculate the maximum bending moment.

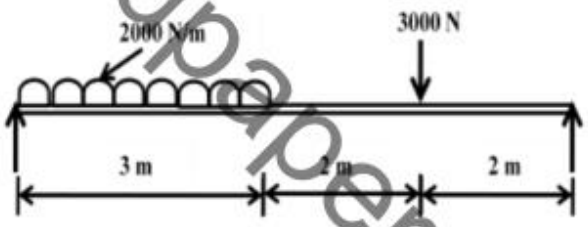

Figure: 1

b) Draw the Shear force and bending moment diagrams for a cantilever beam carrying an udl of intensity 'w' N/m and a point load 'P'N at the free end. [8+7]

3.a) Derive pure bending equation from first principles.
b) A 400 mm × 200 mm I –girder has 10 mm thick flanges and 8 mm thick web it is subjected to a shear force of 100kN at a particular section. Find the maximum shear stress in the web and flange. [8+7]

4.a) Determine the slope at supports and deflection at points D and C by Conjugate beam method shown in Figure 2.

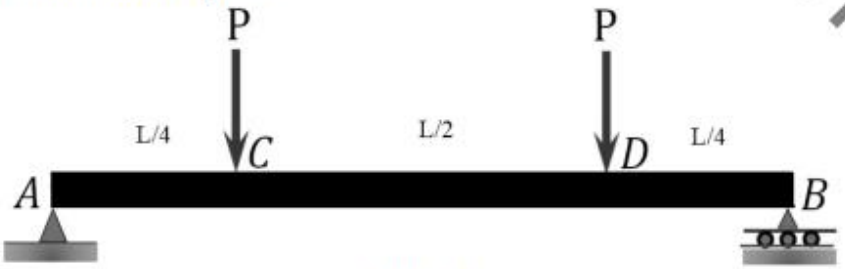

Figure: 2

b) State the Mohr's theorems and limitations of the 'Moment Area method'. [10+5]

5. The cross-section of simply supported beam of span 4m is shown in Figure 3. The allowable bending stress in tension is 20MPa. Determine allowable bending stress in compression and the intensity of uniformly distributed load that can be placed over the entire span. [15]

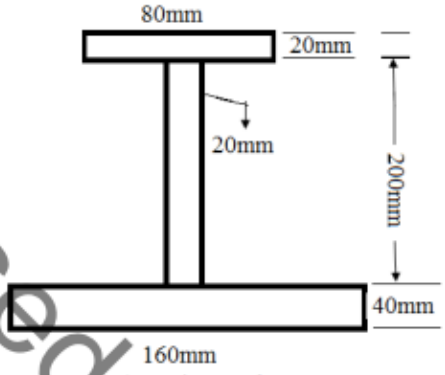

Figure: 3

6.a) A rectangular block of material is subjected to normal and shearing stresses on the planes shown in Figure 4. Find analytically
i) the direction and magnitude of each of the principal stress
ii) magnitude of the greatest shear stress.

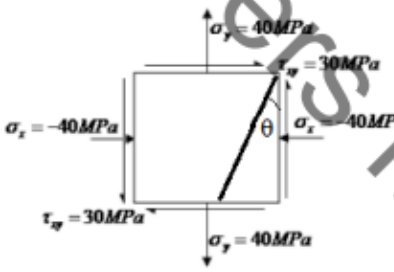

Figure: 4

b) Solve the above problem shown in **Figure 4** by using Mohr's circle method. [8+7]

7. Determine the diameter of a bolt which is subjected to an axial pull of 9 kN together with a transverse shear force of 4.5kN using:
a) Maximum Principal stress theory, and
b) Maximum Principal strain theory.
Given the elastic limit in tension = 225 N/mm^2, factor of safety = 3 and poisson's ratio = 0.3. [15]

8.a) A cantilever of 4m span length carries a load 40 kN at its free end. If the deflection at the free end is not to exceed 8mm, what must be the moment of inertia of the Cantilever section?

b) A simply supported 6m rolled steel joist carries a U.D.L of 10 kN//m length. Determine slope and deflection at a distance of 3m from one end of the beam. [8+7]

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