Code No: W0121 **R07** SET - 1

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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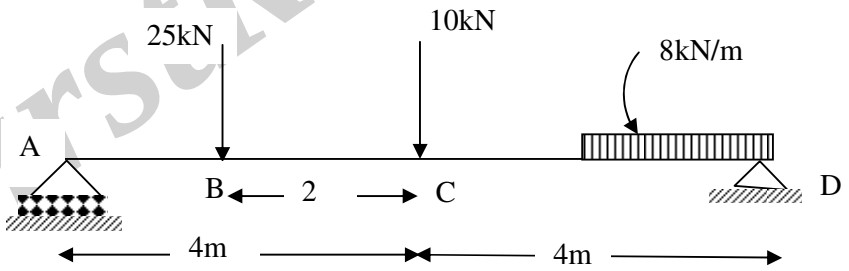
1. a) Derive relation between rigidity and bulk modulus.
   b) A steel bar of 32 mm diameter was subjected to a tensile load of 12 $\times 10^4$ N. The extension in a length of 200mm was found to be 12mm. Find the young's modulus and modulus of rigidity and also the reduction in diameter. Assume poissons ratio as 0.30 (4M+12M)

2. A uniform metal bar has a cross section area of 8cm^2 and a length of 1.6m. With an elastic limit of 150 MN/m^2, what will be its proof resilience? Determine also the maximum value of an applied load which may suddenly applied without exceeding the elastic limit. Calculate the value of gradually applied load which will produce the same extension as that produced by the suddenly applied load above. (16M)

3. Draw the shearing force and bending moment diagrams for the beam in figure and identify salient features.



4. a) State assumptions made in theory of simple bending and derive the relation M / I = E / R = f / Y.
   b) A beam 5m long is supported at one end and at point 1m from the other end. The beam carried a uniformly distributed load of 12 kN / m run over the whole length and concentrated loads of 15 kN at the extreme overhanging end at a section midway between the supports. Determine the deflection of the overhanging load below the supports. Take E = 2×10^5 N/mm^2 and I = 12×10^{-6} m^4. Apply Macaulay's method. (4M+12M)
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Code No: W0121 **R07** SET - 1

5. a) State the assumption in theory of shear and derive the governing formula.
   b) A rolled steel joist 550mm by 200mm having flange and web thickness 15mm and 10mm respectively is used as a beam. If at a section, it is subjected to a shear force of 100kN find the greatest intensity of shear stress in beam taking i) web vertically ii) web horizontally. (4M+12M)

6. a) Derive the general relation between slope and deflection
   b) Derive expression for slope and deflection of a cantilever beam of length L carrying a concentrated load W at free end. Use Double Integration method (6M+10M)

7. a) Explain in detail the various stresses and the corresponding strains in a thin cylindrical shell
   b) A thin cylindrical shell 100mm in diameter and 3m long is having 12mm metal thickness. If the shell is subjected to an internal pressure of 3.5 N/mm^2 Determine i) Change in diameter ii) Change in length and change in volume. $E = 2.0 \times 10^5$ N/mm^2. Poisson's ratio= ¼ (6M+10M)

8. a) Derive Lames expressions governing radial and circumferential stresses in Thick cylinders.
   b) The maximum stress permitted in a thick cylinder of internal and external radii 200mm and 300mm respectively is 25 N/mm^2. If the external pressure is 5N/mm^2 find the internal pressure that can be applied. Plot curve showing variation of hoop and radial stresses through the material. (8M+8M)

Code No: W0121 **R07** SET - 2

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
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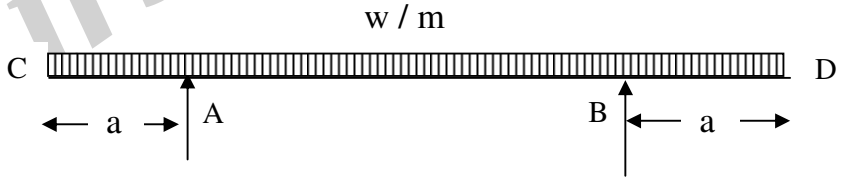
1. a) Derive relation between young's modulus and bulk modulus
b) Explain simple and complimentary shear stresses with neat sketches.
c) Two parallel walls 6 m apart are stayed together by a steel rod of 30mm diameter and is connected at each ends by nuts. The nuts are tightened when the rod is at a temperature of 110^0C. Determine the stresses in rod when the temperature falls down to 20^0C and the ends do not yield. Take E= 2.0×10^5 N/mm^2 and $\alpha = 12 \times 10^{-6}$ N/mm^2 (4M+4M+8M)

2. A steel specimen 1.5cm^2 in cross section stretches 0.05mm over 5cm gauge length under an axial load of 30kN. Calculate the strain energy stored in the specimen at this point. If the load at the elastic limit for specimen is 50kN, calculate the elongation at the elastic limit and the resilience. (16M)

3. A beam of length L is simply supported on two intermediate supports movable along the length, with equal overhangs on either side. The supports are so adjusted that the maximum B.M. is the minimum possible. Determine the position of the supports and draw the B.M. and S.F. diagrams for the position. The beam carries a uniformly distributed load of w per unit length throughout the beam below figure. (16M)



4. a) State the assumptions of the theory of simple bending and derive the governing formula.
b) A test beam 30mm square in section is broken by a load of 1250N applied at the center of a span of 1meter. Using the factor of safety of 8, calculate the safe uniformly distributed load for a beam 100mm wide and 300mm deep freely supported over a span of 4.5m. (8M+8M)

5. a) State the assumption in theory of shear and derive the governing formula.
b) The section of the beam is an isosceles triangle with base of 230mm and side angles 30 degrees. It is used with the base horizontal and caries a shear force of 50 kN at a section. Find the magnitude of the maximum shear intensity at the section and the shear intensity at neutral axis. (8M+8M)
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Code No: W0121 **R07** SET - 2

6. a) Derive the general relation between slope and deflection.
   b) Derive expression for slope and deflection of a cantilever beam of length L carrying Uniformly distributed load w/m run through the span. Use Double Integration method.
   (6M+10M)

7. a) Explain in detail the various stresses and the corresponding strains in a thin cylindrical shell
   b) A thin cylindrical shell 1000mm in diameter and 4m long is having 15mm metal thickness. If the shell is subjected to an internal pressure of $5N/mm^2$ Determine (i) change in diameter ii) change in length and change in volume. $E = 2.0 \times 10^5$ N/mm^2. Poisson's ratio= ¼
   (4M+12M)

8. a) Derive Lames equations governing circumferential and radial stresses in a thick cylinder subjected to internal pressure.
   b) A water pipe has internal diameter of 350mm and metal thickens of 5cm. The pipe carries a water pressure of 10 N/mm^2. Calculate maximum and minimum intensities of circumferential stress and sketch the distribution of circumference and radial stress across the diameter of the pipe. (6M+10M)

Code No: W0121 **R07** SET - 3

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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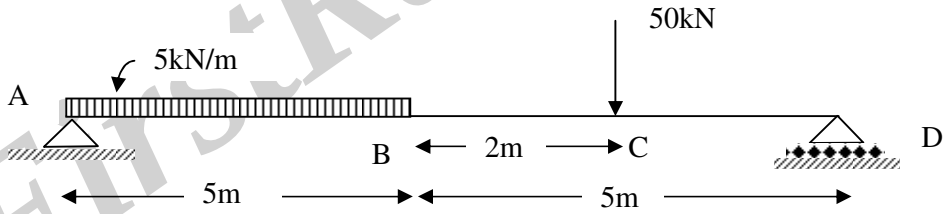
1. a) Sketch a typical load deflection curve obtained from tension test conducted on mild steel specimen and explain salient features.
b) A steel bar of 24mm diameter was subjected to a tensile load of 8×10^4 N. The extension in a length of 250mm was found to be 5mm. Find the young's modulus and modulus of rigidity and also the reduction in diameter. Assume poissons ratio as 0.30 (4M+12M)

2. A uniform metal bar has a cross section area of $7.5cm^2$ and a length of 1.5m. With an elastic limit of 135 MN/m^2, what will be its proof resilience? Determine also the maximum value of an applied load which may suddenly applied without exceeding the elastic limit. Calculate the value of gradually applied load which will produce the same extension as that produced by the suddenly applied load above. (16M)

3. Draw the shearing force and bending moment diagrams for the beam in figure (16M)



4. a) Derive the relation between curvature, slope and deflection of the beam.
b) A beam 7.5m long is simply supported at both the end. The beam carried a uniformly distributed load of 5 kN/m run over the whole length and concentrated loads of 10 kN at 2m from both the ends. Find the ratio of the maximum deflection and deflection under one load. Take $E = 2 \times 10^5$ N/mm^2 and $I = 12 \times 10^{-6}$ m^4. (8M+8M)

5. a) State the assumption in theory of shear and derive the governing formula.
b) A timber beam of depth 150mm and width 75mm is reinforced with steel plates of 10mm thick along the longer sides. If bending stresses in the composite beam are to be limited to 100 N/mm^2 in steel and $8N/mm^2$ in the timber, estimate the maximum permissible bending moment in the beam. Assume E for steel to be 20 times E for timber. (8M+8M)
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Code No: W0121 **R07** SET - 3

6. a) Explain Macaulay's method for determination of slope and deflection
b) A beam AB of length L simply supported at the ends carries a point load W at a distance 'a' from the left end. Find (i) The deflection under the load. (ii) The maximum deflection. (6M+10M)

7. a) Explain thin spherical shells
b) A copper tube 50mm external diameter and 12mm thick is closely wound with steel wire 8mm diameter. Estimate the tension at which the wire must have been wound if an internal pressure of 6 N/mm^2 produces a tensile hoop stress of $8N/mm^2$ in the tube. $E_w=1.6\ E_c$, 1/ m = 0.3 (8M+8M)

8. A tube of 100mm internal and 120mm external diameter is to be reinforced by shrinking on a second tube of 150mm outside diameter. The compound tube is to withstand an internal pressure of 75 N/mm^2 and the shrinkage allowance is to be such that the final maximum stress in each tube is to be same. Calculate the stress and show diagram of the variation of hoop stress in the two tubes. (16M)

Code No: W0121 **R07** SET - 4

II B. Tech I Semester, Supplementary Examinations, Nov – 2012
STRENGTH OF MATERIALS - I
(Civil Engineering)

Time: 3 hours Max. Marks: 80

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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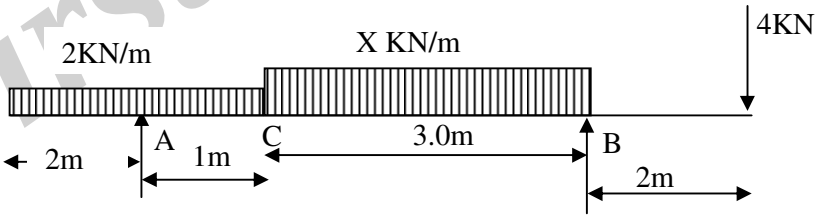
1. a) Derive relation between young's modulus and bulk modulus
b) Three bars made of Copper, Zinc and Aluminum are equal length and have cross sectional areas of 400, 800 and 1200 mm^2 respectively. They are rigidly connected at their ends. If compound member is subjected to a longitudinal pull of 350kN, estimate the proportion of load carried by each bar and induced stresses. Elastic moduli of Copper, Zinc and Aluminum to be 1.2×10^5 N/mm^2 $^{1.0} \times 10^5$ N/mm^2 and 0.89×10^5 N/mm^2 respectively. (4M+12M)

2. A steel specimen $1.2cm^2$ in cross section stretches 0.03mm over 5cm gauge length under an axial load of 25kN. Calculate the strain energy stored in the specimen at this point. If the load at the elastic limit for specimen is 50kN, calculate the elongation at the elastic limit and the resilience. (16M)

3. A beam with overhanging ends rests freely on two supports A and B is loaded as shown below. What must be the intensity of loading in KN/m on the beam between C and B if the shearing force is to be zero at a cross section 1.5 m to the left of support B. Draw S.F and B.M diagram and find out the point of contra flexure? (16M)



4. a) State the assumptions of the theory of simple bending and derive the governing formula.
b) A test beam 25mm square in section is broken by a load of 1200N applied at the center of a span of 1meter. Using the factor of safety of 7.5, calculate the safe uniformly distributed load for a beam 110mm wide and 300mm deep freely supported over a span of 4.5m. (8M+8M)

5. a) State the assumption in theory of shear and derive the governing formula.
b) A timber beam of depth 350mm and width 100mm is reinforced with steel plates of 8mm thick along the longer sides. If bending stresses in the composite beam are to be limited to 100 N/mm^2 in steel and 8 N/mm^2 in the timber, estimate the maximum permissible bending moment in the beam. Assume E for steel to be 15 times E for timber. (8M+8M)
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Code No: W0121 **R07** SET - 4

6. a) Derive the general relation between slope and deflection.
   b) Derive expression for slope and deflection of a cantilever beam of length L carrying Uniformly distributed load w/m run through the span. Use Double Integration method. (6M+10M)

7. a) Explain in detail the various stresses and the corresponding strains in a thin cylindrical shell
   b) A thin cylindrical shell 100mm in diameter and 3m long is having 12mm metal thickness. If the shell is subjected to an internal pressure of 3.0 N/mm^2 Determine i) Change in diameter ii) Change in length and change in volume. E = 2.0×10^5 N/mm^2. Poisson's ratio= ¼ (6M+10M)

8. a) Derive Lames expressions governing radial and circumferential stresses in Thick cylinders
   b) Calculate the minimum wall thickness of a thin cylindrical shell 1000mm in diameter if it has to withstand an internal pressure of 2 N/mm^2 and longitudinal stress not to exceed 30 N/mm^2 and hoop stress not to exceed 40 N/mm^2 (i) change in diameter (ii) change in length and change in volume. E = 2.0×10^5 N/mm^2. Poisson's ratio= ¼ (8M+8M)