# AR13

**CODE: 13CE2001** **SET 1**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**II B.Tech I Semester Regular / Supplementary Examinations, December, 2015**
**STRENGTH OF MATERILAS-1**
**(CIVIL ENGINEERING)**

**Time: 3Hours** **Max Marks:70**

**PART –A**

**ANSWER ALL QUESTIONS** **[1 x 10=10M]**

1. (a) Define factor of safety.
   (b) Define Bulk Modulus.
   (c ) At any section of a beam, slope of the bending moment diagram is equal to _____
   (d) Reacting moment at the support of a cantilever beam of length 'l' subjected to a moment 'M' in anti-clock wise direction at a distance 'a' from the support of the cantilever _____
   (e) What is the shear force at left support of a simply supported beam of length 'l', subjected to an anti-clock wise moment 'M' at the centre of the span of the beam?
   (f) Draw the shear stress variation across a homogenous I section of a beam.
   (g) If an extreme fiber stress of a beam section is $f_{max}$ and the bending moment at the section is M, section modulus of the section is _____.
   (h) Find the slope of a simply supported beam at left support subjected to UDL of w/m throughout its length 'l'.
   (i) If a member is restrained at both ends and if the temperature is reduced what is the type of stress that is developed in the member?
   (j) What is the deflection of a cantilever of span 'l' at half the length, when subjected to concentrated load of W at the tip of the cantilever?

**PART – B**

**Answer one question from each unit** **[5 x 12 = 60M]**

**UNIT – I**

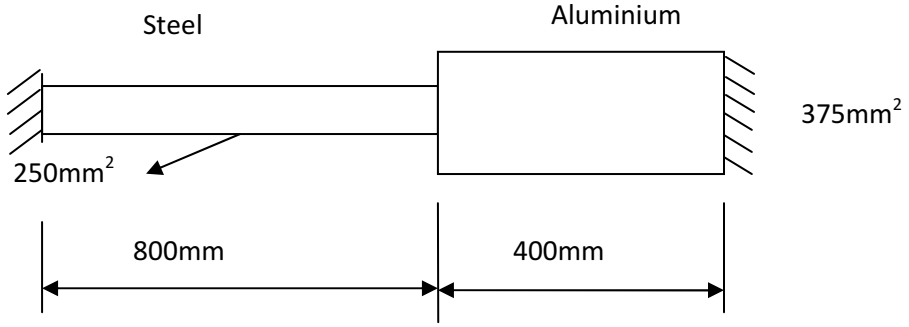
2. a) Find the extension of a bar uniformly tapering from diameter $d_1$ at one end to a diameter d2 at the other end, when subjected to an axial load P. **[7M]**

b) Two vertical rods are each fastened at their upper ends at a distance of 600mm apart. Each rod is 3m long and 12mm in diameter. A horizontal rigid cross bar connects the lower ends of the rods and on it is placed a load of 4500N so that the cross bar remains horizontal. Find the position of the load on the cross bar and the stresses in each rod. One rod is of steel for which E = 1.96 x $10^5$N/mm$^2$ and the other of bronze for which E = 0.63 x $10^5$N/mm$^2$. **[5M]**

**(OR)**

3. a) A composite bar consisting of steel and aluminium components shown in figure below is connected to two grips at the ends at a temperature of $60^0$C. Find the stresses in the two rods when the temperature falls to $20^0$C.

i) if the ends do not yield, ii) if the yields by 0.25mm. Take $E_s$ = 2 x $10^5$N/mm$^2$, $E_a$ = 0.7 x $10^5$N/mm$^2$, $\alpha_s$ = 1.17 x $10^{-5}$ /$^0$C and $\alpha_a$ = 2.34 x $10^{-5}$/$^0$C. Areas of the steel and aluminium bars are 250mm$^2$ and 375 mm$^2$ respectively. **[8M]**

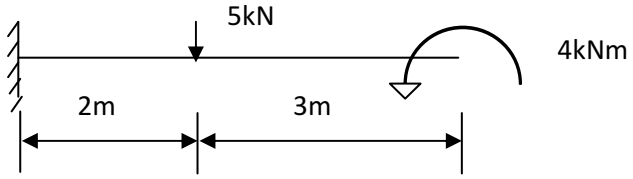



b) The modulus of rigidity of a material is 0.8 x $10^5$N/mm$^2$. When a 6mm x 6mm rod of this material was subjected to an axial pull of 3600N it was found that the lateral dimension of the rod changed to 5.9991mm x 5.9991mm. Find the Poisson's ratio and the modulus of elasticity**. [4 M]**

## UNIT - II

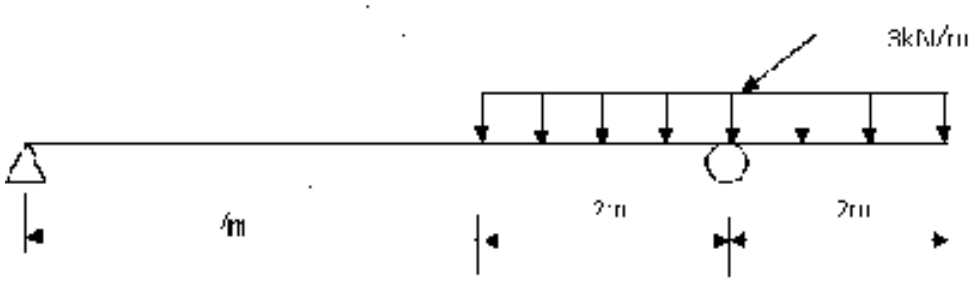
4. a) Derive the inter-relation between load, shear force and bending moment diagrams of a beam. **[7M]**

b) Draw shear force and bending moment diagrams for the following structure. **[5M]**

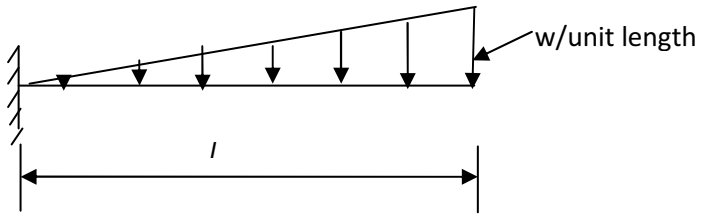


**(OR)**

5. a) Draw shear force and bending moment diagrams for the following structure. **[7M]**




b) Draw shear force and bending moment diagrams for the following structure. **[5M]**




## UNIT - III

6. a) A timber beam is freely supported on a span of 6m. What is the maximum uniformly distributed load that can be allowed on to the beam so that the maximum stress in the beam does not exceed the safe stress of 8 $N/mm^2$? Breadth and depth of the beam are 150mm and 300mm. (Ignore the self weight of the beam) **[6M]**

b) Derive flexure formula from first principles. **[6M]**

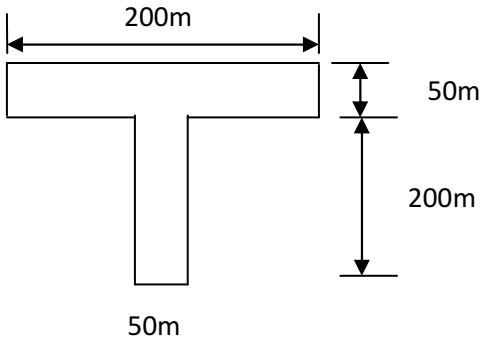
**(OR)**

7. A cast iron cantilever beam subjected to bending has a cross-section of I-form with unequal flanges. The total depth of the section is 280mm and the web and flanges are 40mm thick throughout. The top flange is 200mm wide and the bottom flange is 120mm wide. Find the position of neutral axis and moment of inertia of the section about the neutral axis and determine the maximum bending moment that should be imposed on this section if the tensile stress in the top flange is not to exceed $20N/mm^2$. What is then the value of the maximum compressive stress in the bottom flange? **[12M]**

## UNIT-IV

8. a) Derive the equation of shear stress distribution and write down assumptions. **[6M]**

   b) A T- shaped cross section of a beam shown below is subjected to vertical shear force of 100kN. Calculate the maximum shear stress and at the junction of web and flange. Moment of inertia of the section about the horizontal neutral axis is $1.134 \times 10^8 mm^4$. **[6M]**




**(OR)**

9. A beam of I section 500mm deep and 190mm wide has flanges 25mm thick and web 15mm thick. It carries a shearing force of 400kN at a section. Calculate and show the shear stress values at the junction of flange and web and maximum shear stress in a shear stress diagram. Also calculate the shear force carried by the web. **[12M]**

## UNIT – V

10. a) Derive differential equation for deflection. **[7M]**

    b) Find the deflection at the mid span of a simply supported beam when subjected to a concentrated load W at its mid span from first principles. **[5M]**

**(OR)**

11. A simply supported beam of span L is subjected to equal loads W/2 at each of 1/3rd span points. Find the expressions for deflection under the load and at mid span. **[12M]**



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# AR13 **Set 02**

**Code: 13EC2003**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**II B.Tech I Semester Regular / Supplementary Examinations, December, 2015**
**SWITCHING THEORY AND LOGIC DESIGN**
**(Common to EEE & ECE)**

**Time: 3 hours** **Max. Marks: 70**

## PART – A

**Answer all Questions** [10X1=10M]

1. a) Convert 4 $A8C_{16}$ to binary.
   b) Convert $(1001011)_2$ to Gray code.
   c) Find the min term designation of $\overline{A}\,\overline{B}\,C\,\overline{D}$.
   d) Write the truth tables of NAND and NOR gates.
   e) What is ASCII Code?
   f) Write the 2's complement of $(72)_{10.}$
   g) Convert JK Flip-Flop as type TFlip – Flop.
   h) Define combinational logic circuit.
   i) What are the parity checking codes?
   j) What is the use edge triggering of Flip-Flops?

## PART – B

**Answer one question from each unit** [5x12=60M]

### UNIT - I

2. (a) Represent the decimal digit 396 in [6 M]
   (i) Binary Code (ii) BCD Code (iii) Excess -3 Code
   (iv) Gray Code (v) Octal Code (vi) Hexa decimal
   (b) Detect and correct any errors in the following even parity hamming code 0101110. [6 M]

**(OR)**

3. (a) Convert the following binary numbers to hexa decimal and octal. [4 M]
   (a) 100101010011 (b) 1011 . 111010101101
   (b) What is the BCD equivalent of the Gray Code 1110? [2 M]
   (c) Generate the even parity hamming code for the binary data 1101. [6 M]

### UNIT – II

4. (a) What are Universal gates? Why are they called so? Implement Ex-or gate Using Universal gates. [6 M]
   (b) Prove that $\overline{A}\,B\,C + A\overline{B}\,C + A\,B\,\overline{C} + ABC = A\,B + B\,C + A\,C$ [3 M]
   (c) Convert the function $F(A, B, C) = (A+B)\,C + A\,\overline{C}$ to standard form (i) Sum of minterm form (ii) Product of maxterm form [3 M]

**(OR)**

5. (a) What are Logic gates? Draw the logic symbols and give the truth tables of AND, OR, NAND, NOR, EX – OR and EX – NOR gates. [6 M]
   (b) Minimize the expression using Boolean thermos [3 M]
   $Y = A\,\overline{B}\,C + A\,B\,\overline{C} + \overline{A}\,\overline{B}\,C + \overline{A}\,B\,C + \overline{A}\,\overline{B}\,\overline{C}$
   (c) Convert the following expression into sum of product form.
   $Y = (AB + C)(B + \overline{C}\,D)$ [3 M]

**UNIT - III**

6. (a) Minimize the following logic function $F(A,B,C,D) = \sum m(1,4,7,10,13) + \sum d(5,14,15)$ using K-map [6 M]
   (b) Design a 4-bit Binary to Gray Code convertor. [6 M]

**(OR)**

7. (a) Find the minimal pos form for $F(w, x, y, z) = \sum(0,2,4,9,12,15) + d(1, 5, 7, 10)$ using K-map [6 M]
   (b) Design a 3 bit Binary to excess – 3 code converter. [6 M]

**UNIT - IV**

8. (a) Design a combinational circuit whose input is a four bit number and whose output is the 2's complement of the input number. [6 M]
   (b) What is a multiplexer? Design a 8 x 1 multiplexer using NAND gates. [6 M]

**(OR)**

9. (a) What is the difference between a decoder and demultiplexer? Design a 4 to 16 line decoder. [6 M]
   (b) Design a BCD adder circuit [6 M]

**UNIT - V**

10. (a) What is Race – around condition problem in JK Flip-Flops and explain The method of eliminating this problem [6 M]
    (b) What is a shift register? Show that a shift register can be used as a ring counter [6 M]

**(OR)**

11. (a) Draw the Circuit of D latch using NAND gates and explain its operation. [4 M]
    (b) Convert SR Flip-Flop to D Flip – Flop. [2 M]
    (c) Design a Counter for the sequence 0, 1, 3, 5, 7, 0 using JK Flip – Flops. [6 M]

# AR13 **Set 01**

**Code: 13ME2004**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**II B.Tech I Semester Regular / Supplementary Examinations, December, 2015**
**MECHANICS OF SOLIDS**
**(MECHANICAL ENGINEERING)**

**Time: 3 hours** **Max. Marks: 70**

## PART – A

**Answer all Questions** [10X1=10M]

1.a) Define Factor of Safety
b) What do mean by Principal of Superposition
c) Define the terms: principal plane and principal stresses
d) List the types of beams
e) Define point of inflexion
f) What is the section modulus for the Hallow circular section
g) What is the meaning of 'strength of a section ?
h) What is the slope and deflection of a cantilever with UDL over the whole length of span
i) What do you mean by Lames equations?
j) What is difference between thick and thin cylinders?

## PART-B

**Answer one question from each unit** **[5X12=60M]**

### UNIT-I

2. a) A tensile load of 40 kN is acting on a rod of diameter 40mm and length of 4 m. A bore of diameter 20mm is made centrally on the rod. To what length the rod should be bored so that the total extension will increase 30% under the same tensile load. Take E= $2X10^5$ N/mm$^2$. [6M]

b) A bar of 30 mm diameter is subjected to a pull of 60 kN The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004 mm. Calculate
i). Young's modulus ii) Poisson's Ratio iii) Bulk modulus. [6M]

**(OR)**

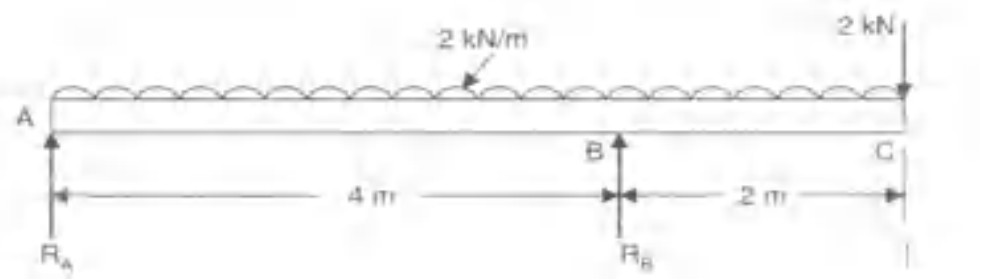
3. A rectangular block of material is subjected to a tensile stress of 110 N/mm$^2$ on one plane and tensile stress of 47 N/mm$^2$ on the plane at right angles to each other. Each of the above stresses is accompanied by a shear stress of 63 N/mm$^2$ and that associated with the tensile stress tends to rotate the block anticlockwise. Find:
i) The direction and magnitude of each of the principal stress and
ii) Magnitude of the greatest shear stress [12M]

### UNIT-II

4. A simply supported beam of length 5 m, carries the uniformly increasing load of 800 N/m run at one end to 1600 N/m run at the other end. Draw the Shear Force and Bending Moment diagram for the beam. Also calculate the position and magnitude of maximum bending moment. [12M]

**(OR)**

5. Draw the Shear Force and Bending Moment diagram for overhanging beam carrying Uniformly distributed load 2 kN/m over the entire length and a point load of 2kN as shown in Fig. (1). Locate the point of contraflexure.




[12M]

**UNIT-III**

6. a) What are the assumptions made in the theory of simple bending? [3M]
   b) Three beams have the same length, same allowable bending stress and the same bending moment. The cross section of the beams is a square, rectangle with depth twice the width and a circle. Find the ratios of weights of the circular and rectangular beams with respect to square beams. [9M]

**(OR)**

7. Prove that the maximum shear stress in a circular section of a beam is 4/3 times the average shear stress. [12M]

**UNIT-IV**

8. A beam of length 5m and of uniform rectangular section is simply supported at its ends. It carries a uniformly distributed load of 9 kN/m run over the entire length. Calculate the width and depth of the beam if permissible bending stress is 7 $N/mm^2$ and central deflection is not to exceed 1cm. Take E for beam material= $1X10^4$ $N/mm^2$. [12M]

**(OR)**

9. Prove that the slope and deflection of a cantilever length L, which carries a gradually varying load from zero at the free end to w/m run at the fixed end are given by $\theta_B=wL^3/24EI$, $Y_B= wL^4/ 30EI$, where EI= Flexural rigidity. [12M]

**UNIT-V**

10. A closed cylindrical vessel made of steel plates 4mm thick with plane ends, carries fluid under a pressure of 3 $N/mm^2$. The diameter of cylinder is 25 cm and length is 75 cm, calculate the longitudinal and hoop stresses in the cylinder wall and determine the change in diameter, length and volume of the cylinder. Take E=$2.1X10^5$ $N/mm^2$ and $\mu$=0.286. [12M]

**(OR)**

11. A compound cylinder is made by shrinking a cylinder of external diameter 300 mm and internal diameter of 250 mm over anther cylinder of external diameter 250mm and internal diameter 200mm. The radial pressure at the junction after shrinking is 8$N/mm^2$. Find the final stresses set up across the section, when the compound cylinder is subjected to an internal fluid pressure of 84.5 $N/mm^2$. [12M]

# AR13 **Set 02**

**Code: 13CS2003**

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI**
**(AUTONOMOUS)**
**II B.Tech I Semester Regular / Supplementary Examinations, December, 2015**
**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE**
**(Common to CSE and IT)**

**Time: 3 hours** **Max. Marks: 70**

**PART – A**

**Answer all Questions** [10X1=10M]

1, a) (Pv~P) is a tautology or contradiction?
b) Give the generating function A(X) for the sequence $a_n=(n+1)$?
c) What is a POSET?
d) Give the principle of Mathematical Induction?
e) State the Euler's theorem?
f) Give the chromatic number for Cycle if the length is even?
g) What is meant by Bi – partite graph?
h) What is the difference between tree and graph?
i) What is meant by Coset?
j) Show that 3 and 24 integers are congruent modulo 7

**PART– B**

**Answer one Question from each unit** [5X12=60M]

**UNIT– I**

2. Show that the following are equivalent formulas:
a) [P v (P^Q)←→P] (Using truth table) [6 M]
b) [P v (~P^Q)←→P vQ] (Using rules of propositions) [6 M]

**(OR)**

3. a) Obtain the PDNF of : P→((P→Q) ^~(~Q v P)) [6 M]
b) Prove (or) Disprove the validity of the following argument.Every living thing is a Plant or animal. Davids dog is alive and it is not a plant.All animals have hearts. Hence, David's dog has a heart. [6 M]

**UNIT– II**

4. a) State and Prove the Fermat's theorem with suitable example? [6 M]
b) Discuss the Euclidean Algorithm with suitable example? [6 M]

**(OR)**

5. a) Use Principle of Mathematical Induction to Prove that : $6^{n+2}+7^{2n+1}$ is divisible by 43 for each +ve integer n. [6 M]
b) Use Principle of Mathematical Induction to Prove that for all Integers: $n \geq 4$, $3^n > n^3$. [6 M]

**UNIT– III**

6. a) Explain BFS spanning tree algorithm with suitable example. [6 M]
b) What is meant by Isomorphism? Discuss Isomorphism's with suitable example graphs. [6 M]

**(OR)**

7. a) Prove that every simple planar graph is 5 – colorable. [6 M]
   b) Show that A complete graph Kn is planar iff $n \leq 4$. [6 M]

**UNIT– IV**

8.Draw the Hasse – diagram for the post $[D_8;/]$. Where '/' is the divisibility relation. Find all special elements of POSET?Determine this POSET is lattice or not. [12 M]

**(OR)**

9. Explain the homomorphision of the Semi groups and monoids with suitable example? [12 M]

**UNIT– V**

10.a) Find the coefficient of $X^{25}$ in $(X^2+X^3+X^4+X^5+X^6)^7$ [6 M]

b) Compute the coefficients of $\sum d_r X^r = \frac{X^5}{X^2-5X+6}$ [6 M]

**(OR)**

11.a) The number of virus effected files in the system is 1000 and this increases 250% every two hours. Use recurrence relation to determine the number of effected files in the system after one day. [6M]
   b) Solve the recurrence relation $a_n = a_{n-1}+n$, $n \geq 1$ where $a_0=2$ by substitution method. [6M]