

VVM's

Shree Damodar College of Commerce and Economics, Margao Goa  
F.Y.B.C.A, Semester II, End Semester Examination, April 2015

DISCRETE MATHEMATICS (BCA 204)

Duration: 2 hours

Total Marks: 50

Instructions: 1) All questions are compulsory.  
2) Figures to the right indicate full marks.

1. Answer the following

a. Perform the following conversions

Marks(1 X 5)

- i.  $(378)_{10}$  to binary number
- ii.  $(1521)_8$  to octal number
- iii.  $(FE1C)_{16}$  to decimal number
- iv.  $(694)_{10}$  to hexadecimal number
- v.  $(1101010)_2$  to decimal number

b. Answer the following questions.

Marks(1 X 5)

- i. Write the dual of the statement  $(1+p) * (q+0)$
- ii. If A has 4 elements then P(A) has \_\_\_\_\_ elements.
- iii. Draw the logic diagram and symbol for XOR gate.
- iv. Find the inverse for the function  $f(x) = 3x - 1$
- v. How many different words can be formed with the letters of the word 'BHARAT'?

2. Answer the following (Any two)

Marks(5 X 2)

a. Prove by the principle of mathematical induction

$$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$$

- b. Is  $(\sim p) \wedge [(p \vee \sim q) \wedge q]$  a contradiction?
- c. Construct the truth table and draw the symbol of the following gates.  
(1) NAND      (2) XOR      (3) AND      (4) NOR

3. Answer the following (Any two)

Marks(5 X 2)

- a. In a group of 70 cars tested by a garage 15 had faulty tyres, 20 had faulty brakes and 18 exceeded the allowable emission limits. Also 5 cars had faulty tyres and brakes, 6 failed on tyres and emission, 10 failed on brakes and emission and 4 were unsatisfactory in all three respects. How many cars had no faults in these three checks?

Draw an appropriate Venn Diagram.

- b. If  $X = \{1, 2, 3, 4, 5, 6\}$ ,  $A = \{1, 2, 3\}$ ,  $B = \{2, 3, 4\}$ . Verify De Morgan's Laws

- c. Determine whether the relation R is a partial order relation on the set of positive integers if R is defined as  $xRy$  iff  $x \geq y$

**4. Answer the following (Any two)**

**Marks(5 X 2)**

- a. Using binomial theorem, simplify  $(2x^2 - y)^5$ .
- b. A committee of 5 is to be formed from a group of 8 boys and 7 girls. In how many ways can this be done if the committee consists of (i) 3 boys and 2 girls  
(ii) at least one girl  
(iii) at most 2 boys
- c. A 4 digit number is to be formed using the digits from 0 to 9. How many such numbers can be formed if  
(i) the repetition of digits is allowed  
(ii) the repetition of digits is not allowed

**5. Answer the following (Any two)**

**Marks(5 X 2)**

- a. Show that  $f: X \rightarrow X$  where  $X = \{x \in \mathbb{R}, x \neq 0\}$  is defined by  $f(x) = \frac{1}{x}$  is injective and surjective.
- b. Find  $f(g(x))$  and  $g(f(x))$  if  $f(x) = \frac{3x+4}{5x-7}$  and  $g(x) = \frac{7x-4}{5x-3}$ .
- c. Let  $L_1 = \{a, ab, a^2\}$  and  $L_2 = \{b^2, aba\}$  be two languages over the alphabet  $\sigma = \{a, b\}$  then find i)  $L_1 L_2, L_1^2, L_2^2, L^*, L^+$ .

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