2715 AN

Reg. No. | | | | | | | | | | | | |

Question Paper Code : 91127

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Computer Science and Engineering

080230017 – DISCRETE MATHEMATICS

(Regulation 2008)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. State any one of the valid argument forms.

2. Construct the truth table for $\sim (p \wedge q)$.

3. Symbolize the expression "All the world loves a lover".

4. Define the rule of Universal specification.

5. Let A = {a, b, c} and B = {1, 2, 3}. Then find A × B.

6. Define a relation on a set and give an example.

7. Define characteristic function of a set.

8. Let f and g be the functions from the set of integer to the set of integers defined by $f(x) = 2x + 3$ and $g(x) = 3x + 2$. What is the compositions of f and g also g and f ?

9. Give any two properties of a group.

10. Define a semigroup.

PART – B (5 × 16 = 80 marks)

11. (a) (i) Show that the following premises are inconsistence :

(1) If jack misses many classes through illness, then he fails high school.

(2) If Jack fails high school, then he is uneducated.

(3) If Jack reads a lot of books, then he is uneducated.

(4) Jack misses many classes through illness and reads a lot of books. **(8)**

(ii) Obtain the principle disjunctive normal form of

$S : p \wedge \rceil(q \wedge r) \vee (p \rightarrow q)$. Hence find pcnf. **(8)**

OR

(b) (i) P.T $P \rightarrow S$ is a valued conclusion of the premise. **(8)**

$\rceil P \vee Q, \rceil Q \vee R, R \rightarrow S,$

(ii) Determine whether the following compound proposition is a tautology or not $((p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)) \rightarrow r$. **(8)**

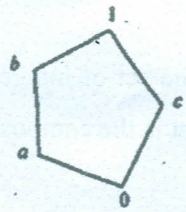
12. (a) Show that $(x)(P(x) \vee Q(x)) \Rightarrow (x)P(x) \vee (\exists x)\, Q(x)$. **(16)**

OR

(b) Explain the rules of (i) universal specification (ii) Existential specification (iii) Existential generalization (iv) universal generalization with examples. **(16)**

13. (a) (i) In a complemented and distributive lattice, prove that complement of each element is unique. **(8)**

(ii) Prove that the lattice whose Hasse diagram given below is not modular. **(8)**



OR

(b) (i) Let A = {1, 2, 3, 4, 5, 6, 7}. Define R on A by x Ry if and only if $x - y$ is divisible by 3. Prove that R is an equivalence relation. **(8)**

(ii) State and prove De Morgan's laws in Boolean algebra. **(8)**

14. (a) (i) If X and Y are finite sets, find a necessary condition for the existence of one-to-one, onto and one-to-one correspondence mapping from X to Y. **(8)**

(ii) Let $f : R \to R$ and $g : R \to R$, where R is the set of real numbers. Find $f \circ g$ and $g \circ f$, where $f(x) = x^2 - z$ and $g(x) = x + 4$. State whether these function are onto, one-to-one and one-to-one correspondence. **(8)**

OR

(b) (i) Show that the function $f(x, y) = x + y$ is primitive recursive. **(8)**

(ii) Let S be a subset of a universal set U. The characteristic function f_s of S is the function from U to the set {0, 1} such that $f_s(x) = 1$ if x belongs to S and $f_s(x) = 0$ if x does not belong to S. Let A and B be sets. Show that for all x, $f_{AUB}(x) = f_A(x) + f_B(x) - f_A(x) \cdot f_B(x)$. **(8)**

15. (a) (i) Show that the composition of two homomorphism is also homomorphism on semi groups. **(8)**

(ii) If R is the set of real numbers and * is the operation defined by a * b = a + b + 3ab where a, b ∈ R show that {R, *} is a commutative monoid. **(8)**

OR

(b) (i) Prove that the set Z_4 = (0, 1, 2, 3} is a commutative ring with respect to the binary operation $+_4$ and $\times_4$. **(8)**

(ii) Find the code words generated by the parity check matrix

$$H = \begin{bmatrix} 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$ when the encoding function is $e : B^3 \to B^6$. **(8)**