Code No: 133BC **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, May/June - 2019
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(Common to CSE, IT)

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

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Find the negative of $p \to q$. [2]

b) Test the validity of the following argument
$p \wedge r \to \neg q$, $\neg q \to r$ $\therefore$ $p \wedge r \to r$ [3]

c) If $f(x) = x^2 - 6 = y$, then find $f^{-1}(y)$. [2]

d) If $f : G_1 \to G_2$ is a homorphism and $a \in G$ then prove that $[f(a)]^{-1} = f(a^{-1})$. [3]

e) How many 5 digit numbers are possible, which are greater than 40000 with the digits 1, 2, 3, 4, 5. [2]

f) Find the number of positive integer solutions of x + y + z = 12. [3]

g) Solve the recurrence relation $u_{n+2} - u_{n+1} - 6u_n = 0$. [2]

h) Find the generating function of the sequence 1, 3, 3^2 ,3^3................ . [3]

i) If the adjacency matrix of the Graph is $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}$, then draw the graph. [2]

j) If G is a k regular graph with 18 edges and the order of the graph is 9. Find the value of k. [3]

PART – B

(50 Marks)

2.a) Test the validity of the following argument.
If I study, I will not fail in the examination.
If I do not watch TV in the evenings, I will study.
I failed in the examination.
Therefore I must watch TV in the evenings.

b) Prove that the following argument is valid.
$\neg \exists x (p(x) \wedge q(x))$
$p(a)$
$\therefore \quad \neg q(a)$ [5+5]

OR

3.a) Prove that $(p \uparrow q) \to r$ and $(p \wedge q) \vee r$ are logically equivalent.

b) Prove that the following argument is valid.

$\forall x p(x) \to \neg q(x)$

$\neg \exists x((r(x) \vee s(x)) \wedge \neg q(x))$

$r(a)$

$\therefore \quad \neg p(a)$ [5+5]

4.a) Let X={1,2,3} and f, g, h and s be functions from X to X given by f={(1,2), (2,3), (3,1)}, g={(1,2), (2,1), (3,3)} h={(1,1), (2,2), (3,1)} Find fog, fohog.

b) If $f : G_1 \to G_2$ is an isomorphism, then prove that $f^{-1} : G_2 \to G_1$ is also an isomorphism. [5+5]

OR

5.a) Prove that the relation a congruent to b mood H is an equivalence relation.

b) Prove that the set of even integers forms a group under addition. [5+5]

6.a) Find the number of solutions of $x_1+x_2+x_3 = 19$ with the condition $x_1 > 1, x_2 > 2, x_3 > 1$.

b) Prove that if 11 integers are selected from among {1, 2, … 20}, then the selection includes integer a and b such that a – b = 2. [5+5]

OR

7.a) Find the number of integers < 250 and divisible by 3 or 5 or 11.

b) Suppose 14 students in a class appear at a university examination. Prove that there exists at least two among them whose seat number differ by a multiple of 13. [5+5]

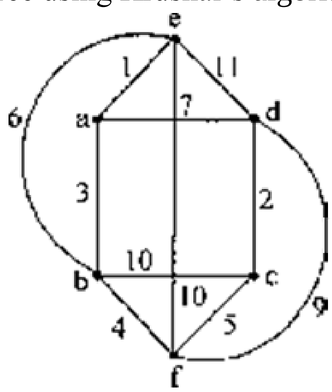
8. Solve the recurrence relation. $u_n - 2u_{n-1} - 3u_{n-2} = 5^n$, $n \geq 2$, $u_0 = 1$, $u_1 = 1$ [10]

OR

9. Solve the recurrence relation using generating function. $u_{n+2} - 2u_{n+1} + u_n = 2^n$, $u_0 = 2$, $u_1 = 1$. [10]

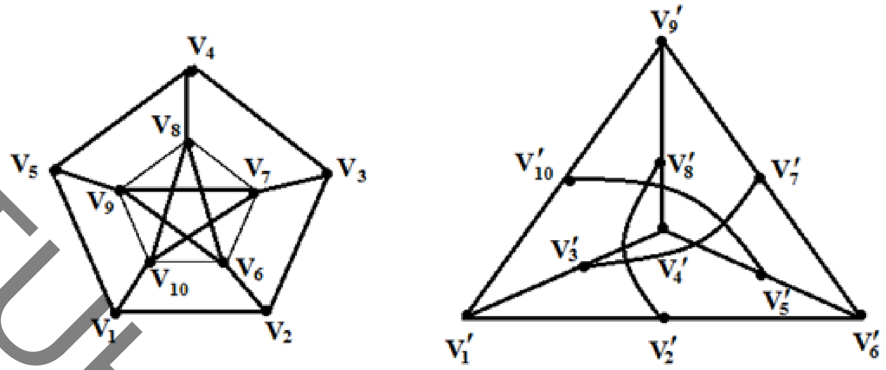
10.a) Suppose that G is a non directed graph with 12 edges. Suppose that G has 6 vertices of degree 3 and the rest have degree less than 3. Determine the minimum number of vertices G can have.

b) Find the minimal spanning tree using Krushal's algorithm. [5+5]



OR

11.a) Show that the following graphs are isomorphic.



b) Prove that a graph G with at least one edge is 2-chromatic if and only if G has no cycle of odd length. [5+5]

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