VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD
B.E. (IT: CBCS) III-Semester Supplementary Examinations, June-2019
Discrete Mathematics

Time: 3 hours   Max. Marks: 60

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Give the converse, the contrapositive and the inverse of the statement "If it rains today, then I will take a cab to college."

2. State the principle of Mathematical Induction.

3. State the fundamental theorem of arithmetic.

4. Define RSA encryption.

5. How many binary strings of length 10 are possible containing exactly 4 zeroes?

6. State the pigeonhole principle.

7. Consider the relation R = {(2, 2), (2, 3), (2, 4), (3, 2), (3, 3), (3, 4)} on the set {1, 2, 3, 4}. Mention whether R is reflexive and symmetric.

8. Define partial order. Is divisibility relation a partial order?

9. Define Isomorphism of graphs.

10. Define chromatic number of a graph.

Part-B (5 × 8 = 40 Marks)

11.a) Use Mathematical Induction to prove that $n! > 3^n$ for $n \geq 7$. [4]

   b) Construct a truth table for $p \rightarrow [\neg q \vee r]$. [4]

12.a) Use the Euclidean algorithm to find d =gcd (3672, 1566). Also express d as linear combination of 3672 and 1566. [4]

   b) Find the solutions of the linear congruence $3x \equiv 4 \pmod 7$. [4]

13.a) Solve the recurrence relation with the given initial conditions $a_n = 2a_{n-1} + 8a_{n-2}$, $a_0 = 4$, $a_1 = 10$. [4]

   b) How many solutions does the equation $x_1 + x_2 + x_3 = 12$ have, where x_1, x_2, and x_3 are non-negative integers? [4]

14.a) Draw the Hasse diagram for divisibility on the set {1, 2, 3, 6, 12, 24, 36, 48}. [5]

   b) Show that the relation $R = \{(a, b)/a \equiv b \pmod m\}$ is an equivalence relation on the set of integers. Where m is a positive integer with $m > 1$. [3]

15.a) Prove that a connected multigraph with at least two vertices has an Euler circuit if and only if each of its vertices has even degree. [4]

   b) Define (i) bipartite graph (ii) complete bipartite graph (iii) Euler path (iv) Hamilton path. [4]

16.a) Are $(p \rightarrow q) \rightarrow r$ and $p \rightarrow (q \rightarrow r)$ logically equivalent? Justify your answer [5]

   b) State and prove Fermat's little theorem. [3]

17. Answer any *two* of the following:

   a) At a certain conference, each participant comes from precisely one of the 50 countries. What is the minimum number of participants who must be registered for the conference to guarantee that there are at least 100 who come from the same country? [4]

   b) Let set S = {a, b, c, d}, and we consider the relation R = {(a, b), (b, c), (c, d)} on set S. What is the transitive closure of R. [4]

   c) State and prove Euler's formula for planar graphs. [4]

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