

B.Tech II Year I Semester (R13) Supplementary Examinations June 2017

DISCRETE MATHEMATICS

(Common to CSE and IT)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Use a Venn diagram to illustrate the set of all months of the year whose names do not contain the letter R.
 - Use set builder notation to give a description of any two of these sets.
 - $\{0, 3, 6, 9, 12\}$
 - $\{-3, -2, -1, 0, 1, 2, 3\}$
 - $\{m, n, o, p\}$
 - Given the relation $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$, decide whether it is reflexive or symmetric or anti-symmetric or transitive.
 - Translate the logical equivalence $(T \wedge T) \vee \neg F \equiv T$ into an identity in Boolean algebra.
 - How many ways are there to select five players from a 10-member tennis team to make a trip to a match at another school?
 - What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades, A, B, C, D, and F?
 - Let $R = \{(1, 1), (2, 1), (3, 2), (4, 3)\}$. Find the powers R^n , $n = 2, 3, 4, \dots$
 - Define multi graph with example.
 - How many edges are there in a graph with 10 vertices each of degree six?
 - Define minimum spanning tree.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

- 2 (a) Show that among any 4 numbers one can find 2 numbers so that their difference is divisible by 3. (Avoid considering the cases separately. Use Pigeonhole Principle!).
- (b) Show that among any $n+1$ numbers one can find 2 numbers so that their difference is divisible by n .

OR

- 3 (a) What is the power set of the set $\{0, 1, 2\}$?
- (b) What is the power set of the empty set? What is the power set of the set $\{\emptyset\}$?
- (c) Use a membership table to show that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$.

UNIT – II

- 4 Show that in a Boolean algebra, the idempotent laws $x \vee x = x$ and $x \wedge x = x$ hold for every element x .

OR

- 5 Consider the following relations on $\{1, 2, 3, 4\}$:
- $R_1 = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 1), (4, 4)\}$,
- $R_2 = \{(1, 1), (1, 2), (2, 1)\}$,
- $R_3 = \{(1, 1), (1, 2), (1, 4), (2, 1), (2, 2), (3, 3), (4, 1), (4, 4)\}$,
- $R_4 = \{(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)\}$,
- $R_5 = \{(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 3), (2, 4), (3, 3), (3, 4), (4, 4)\}$,
- $R_6 = \{(3, 4)\}$.

Which of these relations are reflexive?

UNIT – III

- 6 Explain Groups, Subgroups and Normal Subgroups.

OR

- 7 (a) How many arrangements can be made out of the letters of the word 'ENGINEERING'?
- (b) 25 buses are running between two places P and Q. In how many ways can a person go from P to Q and return by a different bus?

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Contd. in page 2

UNIT – IV

8 Explain briefly about The Growth functions with example.

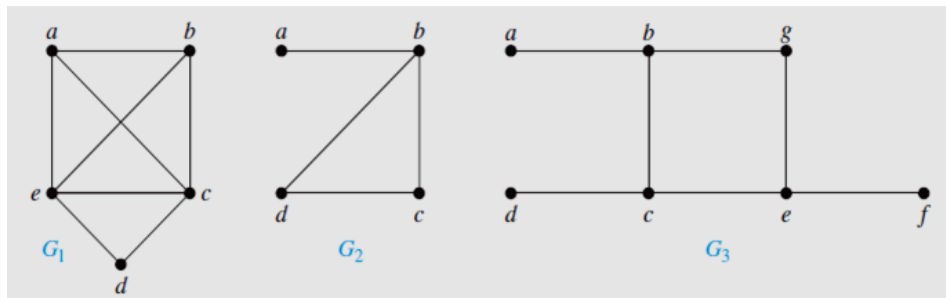
OR

9 Explain the following terms with an example:

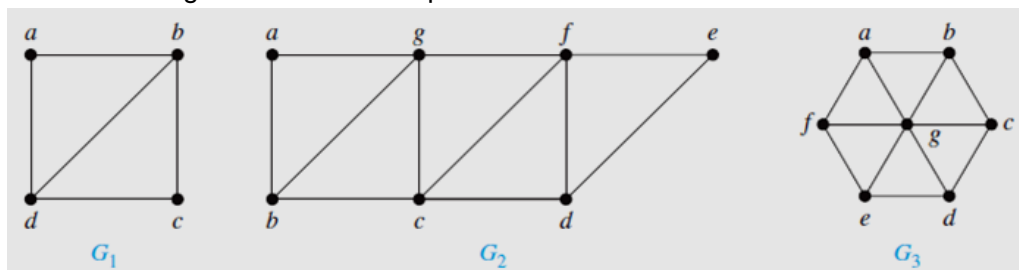
- Generating Functions.
- Recursive Algorithms.
- Correctness of Recursive Algorithms.
- Complexities of Recursive Algorithms.

UNIT – V

10 (a) Which of the following simple graphs in the figure below, have a Hamilton circuit or, if not, a Hamilton path?

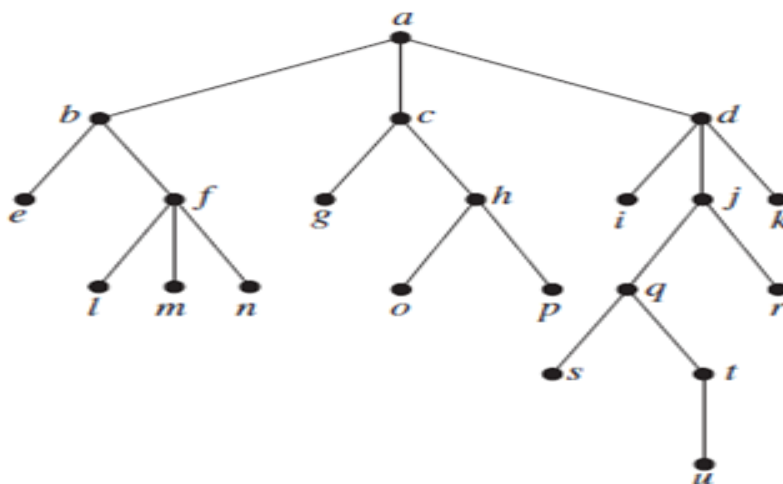


(b) Which graphs shown in Figure have an Euler path?



OR

11 Answer these questions about the rooted tree illustrated.



- Which vertex is the root?
- Which vertices are internal?
- Which vertices are leaves?
- Which vertices are children of j?
- Which vertex is the parent of h?
- Which vertices are siblings of o?
- Which vertices are ancestors of t?
- Which vertices are descendants of b?