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(Pages : 3)

Reg. No. .... 8569

Name .... Ashna

## B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2017

## Second Semester

## DISCRETE MATHEMATICS

(Complementary Course to B.C.A.)

[2013 Admission onwards]

Time : Three Hours

Maximum Marks : 80

## Part A (Short Answer Questions)

Answer all questions.  
1 mark each.

1. Let  $A = \{1, 2, 3, 4\}$  and  $B = \{1, 3\}$ . How many subsets of  $A$  are disjoint from  $B$ ?
2. Define  $A \cup B$ .
3. If  $A \subseteq B$  then find  $A \cup B$ ?
4. Define partial ordering?
5. In how many ways to people can be lined up in a row?
6. How many three element subsets are there of the five element set  $\{1, 2, 3, 4, 5\}$ .
7. Give an example of a compound proposition.
8. Give an example of a tautology.
9. Define an Euler cycle.
10. How many edges are there for a tree with 50 vertices?

(10 × 1 = 10)

## Part B (Brief Answer Questions)

Answer any eight questions.  
2 marks each.

11. Show that  $A \oplus (B \oplus C) = (A \oplus B) \oplus C$ .
12. Draw the Venn diagram of the symmetric differences  $A \oplus B = (A - B) \cup (B - A)$ .
13. Encode the four bit 0011.
14. Let  $A = \{1, 2, 3\}$ . How many different partial orderings are there on  $A$ ?

Turn over

15. If  $A = \{0, 1, a, b\}$ . Find  $P(A)$ ?
16. If  $A = \{a, b, c\}$ ,  $B = (x, y, z)$ . Find  $A \times B$ ?
17. If  $f(x) = x^3$  and  $g(x) = \cos x$ . Find  $f \circ g$  and  $g \circ f$ ?
18. Write two advantages of proof by resolution.
19. Draw the Pascal's triangular array of Binomial Coefficients.
20. How we put a formula in disjunctive normal form?
21. State the chain rule of inference with an example.
22. State the Euler's theorem for polyhedra.

(8 × 2 = 16)

### Part C (Short Essay Type Questions)

Answer any six questions.  
4 marks each.

23. Define an equivalence relation on the set of positive integers and prove it.
24. Explain "Proof by resolution".
25. Show that  $5^n - 4n - 1$  is exactly divisible by 16, for  $n = 1, 2, 3, \dots$
26. Let  $A = \{1, 2, 3\}$ . How many different partial orderings are there on  $A$ ? How many are total ordering.
27. A coin is tossed 20 times :
- How many possible outcomes are there?
  - How many possible outcomes are there with exactly 15 heads and 5 tails?
  - How many with exactly 5 heads in the first 10 tosses?
28. Given a group of 6 Samurai, 7 Lords and 8 Ninjas :
- How many 5-member teams are there consisting of one Samurai, two Lords and two Ninjas?
  - How many 10-member teams with 3 Samurai, 2 Loads and 5 Ninjas?
29. Explain the conjunctive normal form and disjunctive normal form using examples.
30. Explain the Konigsberge bridge problem in graph theory.
31. Write the spanning tree algorithm.

(6 × 4 = 24)



## Part D (Long Essays)

Answer any two questions.  
15 marks each.

32. Use the truth table method to prove the DeMorgan laws :

$$(A \cup B)' = A' \cap B'$$

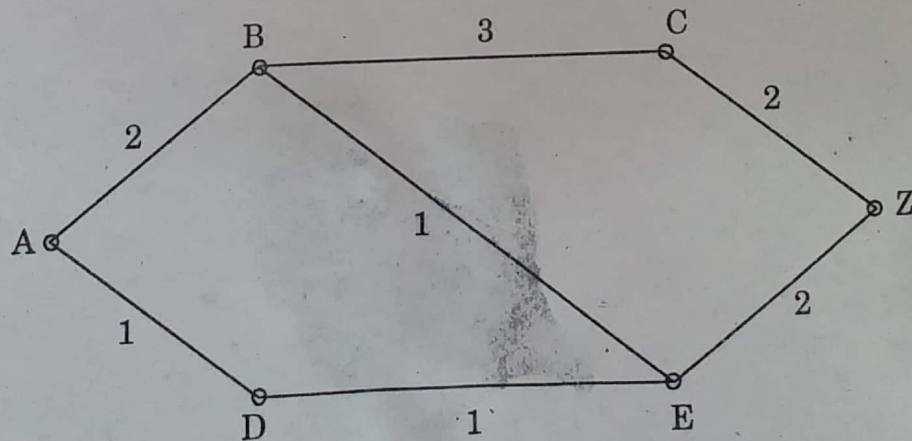
$$(A \cap B)' = A' \cup B'$$

33. Explain Hamming codes and decode the word 1011000 for a (7, 4) Hamming code.

34. Given three men  $M_1, M_2, M_3$ , seven women  $W_1, W_2, \dots, W_7$ , and eight children  $C_1, C_2, \dots, C_8$ , find the number of committees of size five that can be formed containing.

- |                                  |                             |
|----------------------------------|-----------------------------|
| (a) No men.                      | (b) $m_3$ and no other men. |
| (c) $m_3$ and exactly two women. | (d) $m_3, w_1$ and $w_7$ .  |
| (e) Exactly one men.             |                             |

35. Use Dijkstra's algorithm to find shortest paths from B to other vertices for the following graph :—



(2 × 15 = 30)

QP CODE: 19101910



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**B.Sc./BCA DEGREE (CBCS) EXAMINATION, MAY 2019**

**Second Semester**

**Complementary Course - MM2CMT03 - MATHEMATICS - DISCRETE MATHEMATICS (II)**

(Common For B.Sc Computer Science Model III, Bachelor of Computer Application)

**2017 ADMISSION ONWARDS**

AFC96493

**Time: 3 Hours**

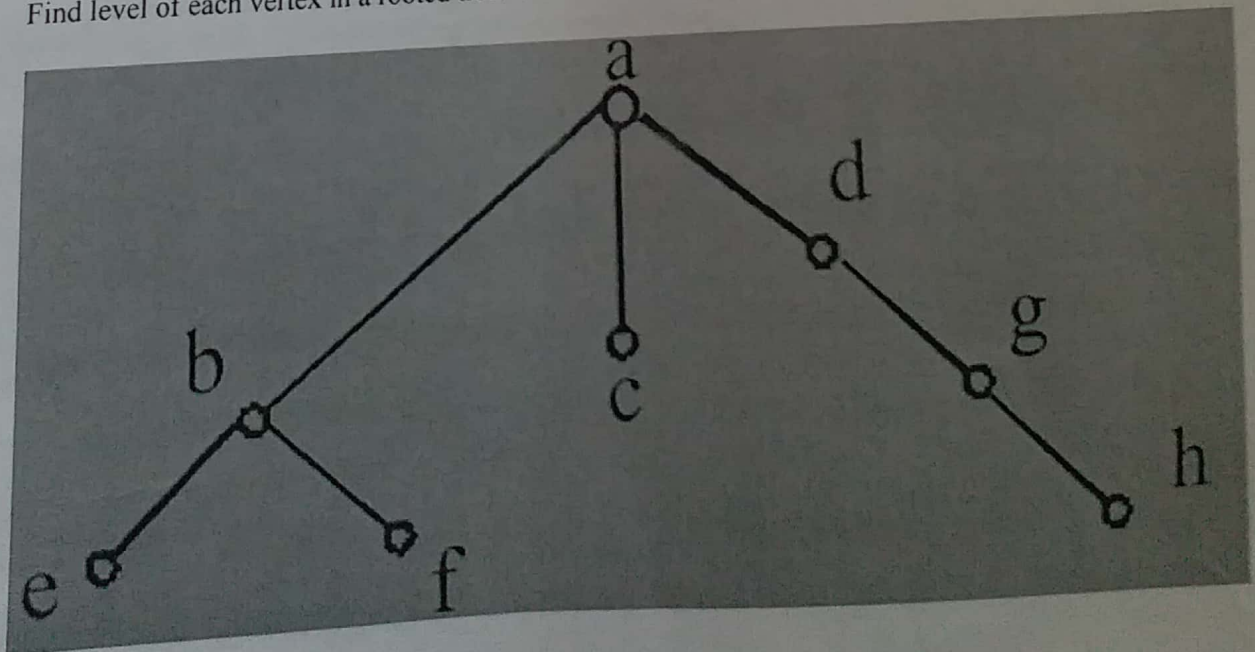
**Maximum Marks: 80**

**Part A**

Answer any **ten** questions.

Each question carries **2** marks.

1. Define Bipartite graph.
2. Draw a graph with the adjacency matrix  
$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$$
3. Define the following with example. (a) path (b) walk.
4. Find level of each vertex in a rooted tree. What is the height of the tree?



5. Draw the Binary search tree of '30, 20, 5, 60, 18'.
6. Draw the Binary tree of the algebraic expression  $((x+y)^2) + ((x+4)/3)$

7. Find a spanning tree of  $K_5$
8. Explain AND gate in Boolean algebra.
9. Check whether the following matrix is skew symmetric

$$A = \begin{pmatrix} 0 & 2 & -6 \\ -2 & 0 & 5 \\ 6 & -5 & 0 \end{pmatrix}$$

10. What is the rank of the matrix given below

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

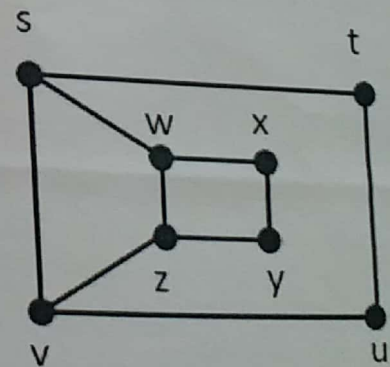
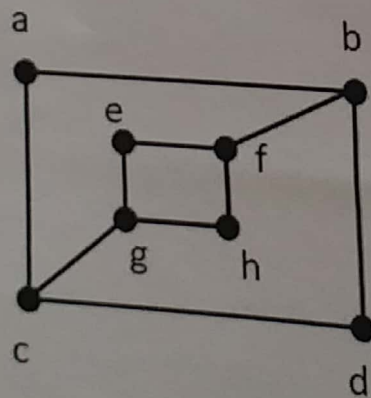
11. Write the characteristic equation of a matrix.
12. State Cayley Hamilton theorem.

### Part B

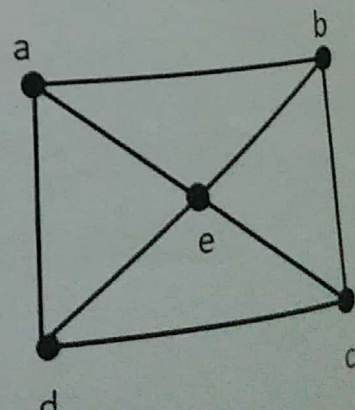
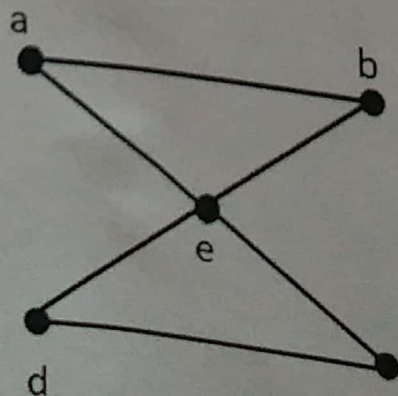
Answer any six questions.

Each question carries 5 marks.

13. Determine whether the following graphs are isomorphic

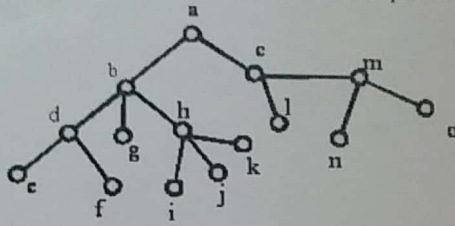


14. Which of the undirected graphs have an Euler circuit? of those that do not, which have an Euler path?





16. What is pre order traversal? Find the pre order traversal of the following tree.



17. Explain BFS Spanning tree using an example .
18. Find the duals of  $x(y+0)$ ,  $(x+1)*0$  and  $\bar{x}.1+(\bar{y}+z)$
19. Verify absorption laws  $x+xy=x$  and  $x(x+y)=x$
20. Given  $A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 3 & 2 \\ 0 & 0 & 2 \end{pmatrix}$ . Find a matrix B such that  $AB = I_3$  where  $I_3$  is the identity matrix of order 3.
21. Check the consistency of the following system.
- $$\begin{aligned} 2x + 5y + 2z &= 0 \\ -4x + 6z &= 0 \\ 12x - 6y &= 0 \end{aligned}$$

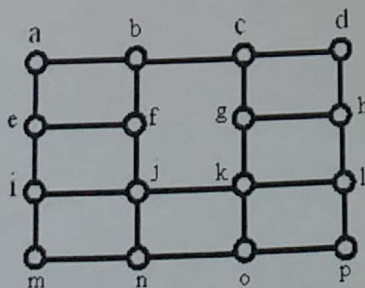
(6×5=30)

### Part C

Answer any **two** questions.

Each question carries **15** marks.

22. Describe graph models with suitable examples.
23. (a) Explain in detail BFS spanning tree of a connected graph.  
(b) Find BFS spanning tree of the following graph starting from the vertex 'a' by explaining steps.



24. Find sum of products 1)  $(\bar{x}+y)z$  2)  $(x+\bar{z})y$
25. Find rank of the given matrix by normal form  $\begin{pmatrix} 3 & 2 & 7 & 9 \\ 1 & 1 & 9 & 5 \\ 4 & 2 & -2 & 6 \\ -5 & -8 & 3 & 7 \end{pmatrix}$

(2×15=30)

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**B.C.A. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2019**

**Second Semester**

**DISCRETE MATHEMATICS**

[Complementary Course to B.C.A.]

(2013—2016 Admissions)

Maximum Marks : 80

Time : Three Hours

**Part A**

*Answer all questions.*

*Each question carries 1 mark.*

1. Distinguish between subset and proper subset.
2. What is an empty set ? Give an example.
3. What is a transitive relation ? Give an example.
4. Find the number of binary bytes that end with 101.
5. What is the number of permutation of the set  $\{a, b, c\}$ , taken two elements of the set at a time?
6. What is a proposition ? Give positive and negative example for proposition.
7. Give the truth table for the conjunction  $P \wedge Q$ .
8. Find the truth value of the following statements :
  - (a) A triangle is equilateral, if it is equiangular.
  - (b) If  $1 = 2$ , then  $3 = 3$ .
9. What is a tree ? Give definition and examples.
10. What is a planar graph ? Give example of nonplanar graph.

(10 × 1 = 10)

**Part B**

*Answer any eight questions.*

*Each question carries 2 marks.*

11. What is a power set ? Find the power set of  $A = \{a, b, c\}$ . What is its cardinality ?
12. Use a Venn Diagram to illustrate the relationship  $A \subseteq B$  and  $B \subseteq C$ .

**Turn over**



13. What is a one-to-one function ?
14. Give the multiplication principle of combinatorics.
15. Find the number of different arrangements of the letters of the word CALCULUS.
16. In how many ways can you select a first prize winner and a runner-up from 25 people ?
17. What is a compound proposition ? How can you find its truth value ?
18. Construct a truth table for the following propositions :

(a)  $\neg P \vee Q$

(b)  $\neg P \wedge \neg Q$ .

19. What is a conjunctive normal form ? Give an example.
20. Give the definition of a graph and show two different types of graphs, based on the definition.
21. Show how a graph can be represented as an adjacency matrix.
22. What is minimal spanning tree?

(8 × 2 = 16)

### Part C

Answer any **six** questions.  
Each question carries 4 marks.

23. Let  $A = \{1, 2, 3, 4, 5\}$  and  $B = \{0, 3, 6\}$ . Find (a)  $A \cup B$ ; (b)  $A \cap B$ ; (c)  $A - B$ ; (d)  $B - A$ .
24. Determine if  $f(x) = x + 1$  from the set of integers to the set of integers, is onto.
25. What is a partially ordered set or poset ?
26. Find the number of six letter words that can be formed from the word MARUTI.
27. A salesperson has to visit eight cities, starting from Trivandrum and ending at Kottayam. In how many ways, can he visit all cities ?
28. Construct a truth table for  $(P \rightarrow \neg Q) \vee (\neg Q \rightarrow P)$ .
29. What is modus tollens ? Give its application with an example.



30. Explain the relationship among the number of regions, vertices and edges of a planar graph, given by Euler.
31. Define the terms binary tree and full binary tree.

(6 + 4 = 10)

### Part D

Answer any **two** questions.  
Each question carries 15 marks.

32. (a) Use induction to prove that  $n^3 - n$  is divisible by 3, whenever  $n$  is a positive integer.  
(b) Show that the divisibility relation is a partial ordering on the set of positive integers.
33. (a) In how many ways can six different statues be arranged around a fountain?  
(b) The chairs in an auditorium are to be labelled with a capital English letter and a positive integer not exceeding 100. What is the largest number of chairs that can be labelled differently?
34. (a) What is a disjunctive normal form? Give the DNF of  $P \wedge (P \rightarrow Q)$ .  
(b) State and explain De Morgan's rules.
35. What is the shortest path problem? How does Floyd's algorithm find the shortest path?

(2 × 15 = 30)