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Total No. of Pages : 03

Total No. of Questions : 16

BCA (2014 to 2018) / B.Sc. (IT) (2015 to 2018) (Sem.-1)

MATHEMATICS-I

Subject Code : BSIT/BSBC-103

M.Code : 10045

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SIX questions carrying TEN marks each and students have to attempt any FOUR questions.

SECTION-A**Write briefly :**

- Q1. If A, B, C are any sets, prove that $A - (B \cup C) = (A - B) \cap (A - C)$.
- Q2. Define partition of sets.
- Q3. Let $X = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$. The family $\{\{1, 4, 8\}, \{3, 5, 9\}, \{2, 7\}, \{6, 10\}\}$ is a partition of X. Determine the equivalence relation corresponding to the above partition.
- Q4. Let $X = \{1, 2, 3, 4\}$ and $R = \{(x, y) : x > y\}$. Draw the diagram and matrix of R.
- Q5. Using truth table, prove that $\sim(p \rightarrow q) = p \wedge \sim q$.
- Q6. Given the proposition over the natural numbers $p: n < 4$, $q: 2n > 17$ and $r: n$ is a divisor of 18. What are the truth sets of $p \wedge q$ and $q \rightarrow r$.
- Q7. Prove that the number of edges in a complete graph with n vertices is $\frac{n(n-1)}{2}$.
- Q8. Draw a simple planar graph with 6 nodes and 11 edges.
- Q9. Define recurrence relation with example.
- Q10. Solve the recurrence relation $S(K) - S(K-1) - S(K-2) = 0$.

SECTION-B

- Q11. a) State and prove De Morgan's Laws for sets.
- b) The relation R is defined by $(a, b) \in R$ if and only if 5 divides $b - a$. Show that R is an equivalence relation.
- Q12. a) Let $R = \{(a, b): |a - b| = 1\}$ and $S = \{(a, b): a - b \text{ is even}\}$ are two relations on $A = \{1, 2, 3, 4\}$. Then
- i) Find matrices of R and S .
- ii) Draw diagrams of R and S
- iii) Using matrices of R and S , find the relation RS .
- b) Test the validity of "If my brother stands first in the class, I will give him a watch. Either he stood first or I was out of station. I did not give my brother a watch this time. Therefore I was out of station."
- Q13. a) Over the universe of Books, define the proposition $B(x)$: x has a blue cover, $M(x)$: x is a mathematics book, $U(x)$: x is published in United Estate and $R(x, y)$: The bibliography of x includes y .

Translate into words :

- i) $(\exists x)(M(x) \wedge \sim B(x))$.
- ii) $(\forall x)(M(x) \wedge U(x) \rightarrow B(x))$
- iii) $(\exists x)(\sim B(x))$

Express using quantifiers :

- i) Every book with blue cover is a mathematics book.
- ii) There are mathematics books that are published outside the United States.
- iii) Not all books have bibliography.
- b) Use Mathematical Induction to show that $1+2+4+\dots+2^n = 2^{n+1}-1$.

Q14. Using Dijkstra's Algorithm, find shortest path from A to D.

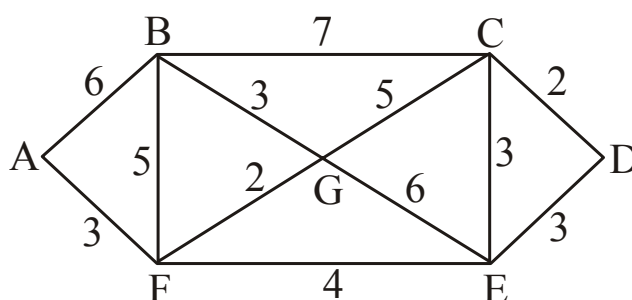


FIG. 1

Q15.a) Find the minimal spanning tree for the following weighted connected graph using Kruskal's Algorithm.

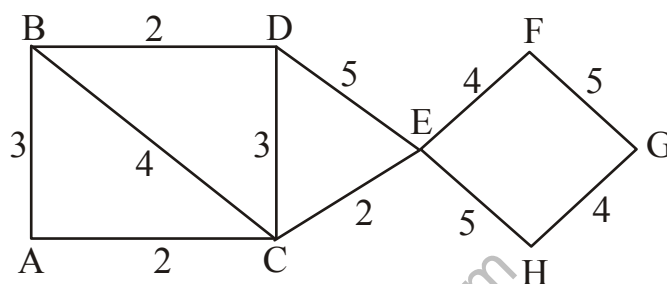


FIG. 2

b) Solve $S(K) - 2S(K-1) + S(K-2) = 0$, where $S(0) = 1$, $S(1) = 2$.

Q16. a) Solve $S(K) - 7S(K-1) + 10S(K-2) = 6 + 8K$, where $S(0) = 1$, $S(1) = 2$.

b) Find inverse of the matrix $\begin{bmatrix} 1 & 1 & 2 \\ 2 & -1 & 3 \\ 3 & -1 & -1 \end{bmatrix}$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.