Roll No. 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 diagraph 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 is even} are two relations on A = {1, 2, 3, 4}. Then

i) Find matrices of R and S.

ii) Draw diagraphs 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 $1+2+4+\ldots\ldots+2^n = 2^{n+1}-1$.

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

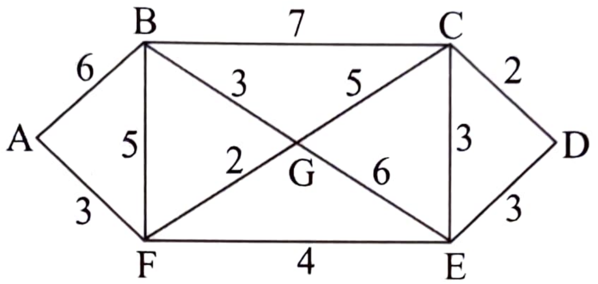

FIG. 1

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

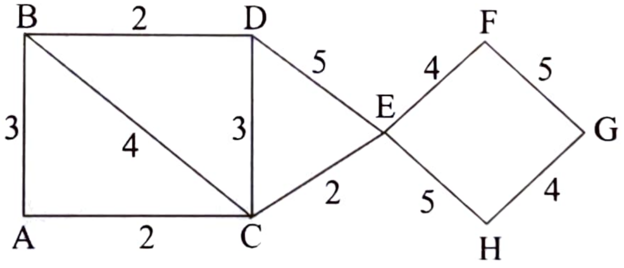

FIG. 2

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

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