 BCA(Sem-II) — Dis. Struc. (202)
Core – IV

2018

Time : 3 hours

Full Marks : 70

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

*Answer from **all** the Groups as directed.*

Group – A

(Multiple-choice Questions)

1. Pick up the correct alternative for each of the following questions : 2×10 = 20

   (a) Onto function is also called :

   (i) Injection

   (ii) Surjection

(iii) Bijection

(iv) None of these

(b) If $|A| = m$, $|B| = n$ then $|A \times B|$ equals to :

(i) m

(ii) n

(iii) mn

(iv) None of these

(c) A relation from set A to set B is subset of :

(i) $A + B$

(ii) $A - B$

(iii) $A \times B$

(iv) None of these

(d) $\neg q \vee p$ is equivalent to :

(i) $p \rightarrow q$

(ii) $q \rightarrow p$

(iii) $\neg q \rightarrow p$

(iv) None of these

(e) In Euler graph, the degree of every vertex must be :

(i) Odd

(ii) Even

(iii) Sometime odd and sometime even

(iv) None of these

(f) P(A) is a power set of A, then which one is true :

(i) $\phi \in A$

(ii) $\phi \in P(A)$

(iii) Both (i) and (ii)

(iv) None of these

(g) ${}_nP_r$ is equal to :

(i) $\frac{n!}{r!}$

(ii) $\frac{n!}{(n-r)!}$

(iii) $\frac{n!}{(n-r)!\, r!}$

(iv) None of these

(h) Big-oh works as an / a :

(i) Lower bound of a function

(ii) Upper bound of a function

(iii) Average bound of a function

(iv) None of these

(i) A graph T is called a tree if :

(i) T is connected and has cycle

(ii) T is not connected and has cycle

(iii) T is connected and has no cycle

(iv) None of these

(j) If $T(n) = T(n-1) + 1$ then T(n) equal to

(i) $0(n)$

(ii) $0(n^2)$

(iii) $0(n^3)$

(iv) None of these

Group – B

(Short-answer Type Questions)

Answer any **four** questions of the following : $5 \times 4 = 20$

2. Compare equivalence relation and partial order relation briefly.

3. Show that $f : P \to R$ given by $f(x) = x^2$ is one-one and onto.

4. Show which of the following is / are equivalent to $p \leftrightarrow q$:

   (i) $(\neg p \vee q) \wedge (p \vee \neg q)$

   (ii) $(\neg p \vee q) \vee (p \to q)$

5. Explain big-omeg a and big-theta with suitable example.

6. From a group of 8 men and 7 women, 6 persons are to be selected to form a committee so that at least 4 men are there it the committee. In how many ways can it be done ?

7. Solve the recurrence relation T(n) by substitution method :

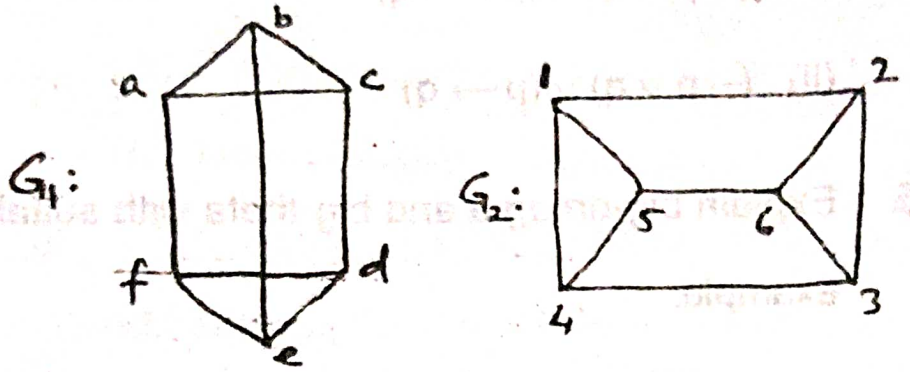
$$T(n) = \begin{cases} 1 & n = 0 \\ 2T(n-1)+1 & n > 0 \end{cases}$$

Group – C

(Long-answer Type Questions)

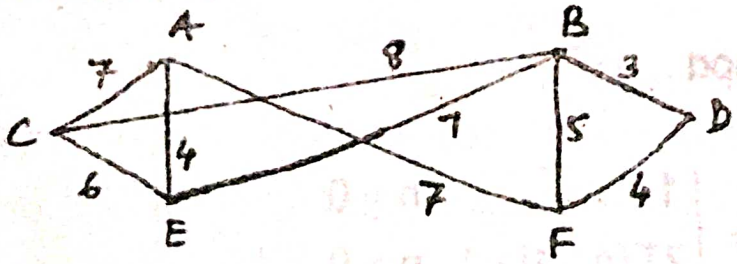
Answer any **three** questions of the following : $10 \times 3 = 30$

8. (a) Here G_1 and G_2 are two graphs, explain whether they are isomorphic or not :



(b) $1 + 2 + 3 + \ldots\ldots + n = \frac{n(n+1)}{2}$, prove the statement by mathematical induction method.

9. Define spanning tree. Find a minimal spanning tree of the weighted graph which is given below :



10. Define tautology. To show, whether the given propositional statements are tautology or not :

(a) $(a \rightarrow b) \rightarrow (b \rightarrow c)$

(b) $(a \vee b) \rightarrow (b \rightarrow c)$

(c) $(a \wedge b) \rightarrow (b \vee c)$

11. (a) Explain master theorem of recurrence relation with suitable example.

(b) $T(n) = 4T(n/2) + n^2$, solve the recurrence relation T(n) by master method.

12. (a) In a room containing 28 people, there are 18 people who speak English, 15 people who speak Hindi and 22 people who speak Bengali, 9 people speak both English and Hindi, 11 people speak both Hindi and Bengali whereas 13 people speak both Bengali and English. How many people speak all three languages ?

(b) A box contains 10 blue balls , 20 red balls, 8 green balls, 15 yellow balls and 25 white balls. How many balls must we choose to ensure that we have 12 balls of same colours ?