[Total No. of Questions: 07] Seat No.: [Total No. of Pages:03]

ESE Sum 2018

G. H. Raisoni College of Engineering and Management, Pune.

(An Autonomous Institution)

S.Y.B.Tech (Computer / Information Engineering) (Term-IV)

ESE Summer -2018 (2016 Pattern)

Graph Theory and Combinatorics (BITL204)

[Time:03 Hours] **[Max. Marks:60]**

Instructions to the candidates:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data if necessary.*
5) *Use of non- programmable electronic scientific calculator is allowed.*

Q.1 **Solve following multiple choice questions:**

a) By mathematical induction $2^n > n^3$, [1]
(a) for $n \geq 1$ (b) for $n \geq 4$ (c) for $n \geq 5$ (d) for $n \geq 10$

b) The negation of the following statement : $\forall\, x, |x| = x,$ is [1]
(a) $\forall\, x, |x| \neq x$ (b) $\exists x, |x| \neq x$ (c) $\exists x, |x| = x$ (d) None of these

c) How many integers less than 12 are relatively prime to 12 [1]
(a) 12 (b) 6 (c) 3 (d) 9

d) What are the quotient and remainder when -11 is divided by 3? [1]
(a) 1,-4 (b) -4,1 (c) -3,-2 (d) -2,-3

e) If R is relation on set A and if (a,a)∈ R,∀ a∈ A, then R is [1]
(a) Symmetric relation (b) antisymetric relation
(c) transitive relation (d) reflexive relation

f) Which of the following is symmetric relation on A={1,2,3} [1]
(a) $R = \{(1,1), (2,3)(1,2)\}$ (b) $R = \{(1,1), (2,3)(1,3)\}$
(c) $R = \{(1,1), (2,1)(1,2)\}$ (d) $R = \{(1,1), (2,3)(1,2)(2,1)\}$

g) A Group (G,*) is called an abelian group if [1]
(a) $a * b = e \forall\, a, b \in G$ (b) $a * b = b * a \forall\, a, b \in G$
(c) $a * a = a \forall\, a \in G$ (d) $a^n = e$ for some integer n

h) Which of the following statement is true? [1]
(a) An integral domain is called Field (b) A Field is an integral domain

(c) An Integral domain has zero divisors (d) A ring without zero divisors is a Field

i) The number of edges, the complete graph K_5 has
(a) 5 (b) 6 (c) 9 (d) 10

j) A graph which can be drawn on the plane such that no edges cross each other, is called
(a) planer graph (b) complete graph
(c) complete bipartite graph (d) Simple graph

k) How many permutations of the letters ABCDEFGH containing the string ABC?
(a) 3! (b) 6! (c) 5! (d) 8!

l) How many ways are there to select five players from 10-member tennis team to make a trip a match at another school?
(a) 252 (b) 522 (c) 593 (d) 720

Q.2 a) Show that $(p \rightarrow q) \wedge (p \rightarrow r)$ and $p \rightarrow (q \wedge r)$ are logically equivalent

b) Use Mathematical induction to show that

$$1 + 2 + 2^2 + \cdots + 2^n = 2^{n+1} - 1$$

For all nonnegative integer n

Q.3 a) Find The hexadecimal expansion of $(177130)_{10}$

b) Define Euclidean Algorithm, using Euclidean Algorithm to find gcd (1529,14039)

Q.4 Solve any two

a) If A={2,3,4,6} , and Let aRb if a divides b .
then show that R is a Partial order and draw its Hasse diagram

b) Solve the recurrence relation together with intial Condition given
$a_n = 6a_{n-1} - 9a_{n-2}$ for $n \geq 2, a_0 = 1, a_1 = 6$

c) If A={1,2,3,4} ,
R={(1,2), (2,1), (2,3), (3,4) (4,1)} Using Warshall Algorithm Find the transitive closure of R

Q.5 Solve any two

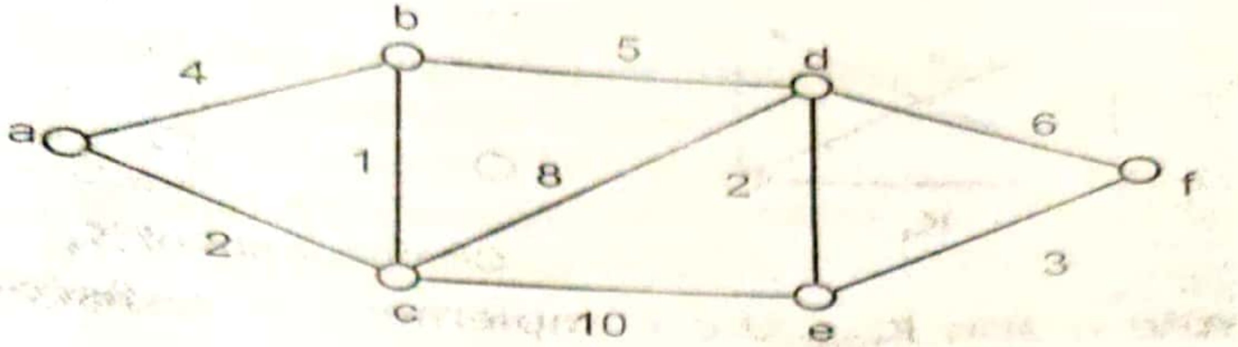
a) Let E be the set of even integers Show that Groups $(Z, +)$ and $(E, +)$ Are isomorphic

b) Define the following terms and give an example of each
i) Integral Domain ii) Fields

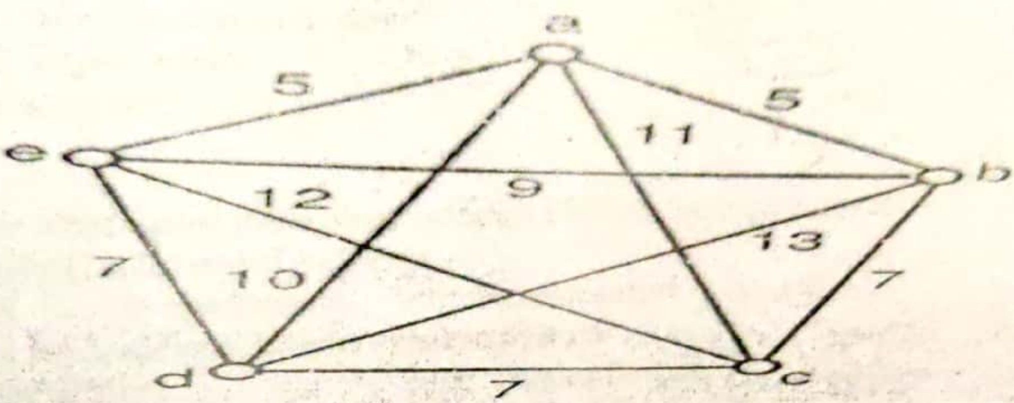
c) For a Positive integer n, Let
$H = nz = \{nx/x \in z\}$, Then Show that $(H, +)$ is a subgroup of $(Z, +)$

Q.6 Solve any two

a) Using Dijkstra algorithm to find the shortest path from a to f



b) Using Kauskal's algorithm to find the minimum spanning tree for the graph shown in following figure. [4]



c) Define the following graphs and give an example of each [4]
i) Simple Graph ii) Complete graph iii) Subgraph iv) Planer graph

Q.7 a) Using generating function to Prove the Pascal's identity: [4]
$\binom{n}{r}=\binom{n-1}{r}+\binom{n-1}{r-1}$ where n and r are positive intgers with $r < n$

b) How many different strings can be made by recording the letters of the word SUCCESS? [4]

—x—