Registration No.:________________ **Paper Code:B**

Course Code:MTH401

Course Title:DISCRETE MATHEMATICS **Max Marks: 70**

Time Allowed: 3hrs.

Read the following instructions carefully before attempting the question paper.

1. Match the Paper Code shaded on the OMR Sheet with the Paper code mentioned on the question paper and ensure that both are the same.
2. This question paper is divided into two parts A and B.
3. Part A contains 30 questions of 1 mark each. 0.25 marks will be deducted for each wrong answer.
4. Part B contains 5 questions of 10 marks each. Attempt any 4 questions out of these 5 questions. In case all the 5 questions are attempted then only the first four attempted questions will be evaluated.
5. Attempt all the questions in serial order.
6. Do not write or mark anything on the question paper except your registration no. on the designated space.
7. After completion of first 90 minutes, the OMR sheet will be taken by the invigilator.
8. Submit the question paper and the rough sheet(s) along with the answer sheet to the invigilator before leaving the examination hall.

Q1)

(1) The minimum number of intersecting points in complete graph K_4 with 4 vertices and complete bipartite graph $K_{3,3}$ respectively

(a) 1 and 1 (b) 1 and 0 (c) 0 and 1 (d) both graphs have no intersecting point.

(2) In the complete graph K_5 with 5 vertices

(a) Euler's theorem satisfied and number of regions are 7.
(b) Euler's theorem satisfied and the number of regions are 7 but the graph is non-planar.
(c) Euler's theorem satisfied and the graph is non-plana but the number of regions are not seven.
(d) The graph is non-planar and Euler's theorem not satisfied.

(3) If G is a simple planar connected graph with m edges and n (> 3) vertices then

(A) $m \geq 3n - 6$ (B) $m \leq 3n - 6$ (C) $n \geq 3m - 6$ (D) $n \leq 3m - 6$

(4) The Four Colour Theorem, to prove the planar graph, is

(a) Necessary but not sufficient (b) Sufficient but not necessary
(c) Necessary and sufficient (d) Neither necessary nor sufficient

(5) Statement: The chromatic number of 3-dimensional cube is 3.
Reason 1: Every complete bipartite graph has chromatic number 3. Reason 2: Three-dimensional cube is a complete bipartite graph.

(a) Statement is correct but neither the reason 1 and nor the reason 2 are correct.
(b) Reason 1 is correct but neither the statement nor the reason 2 are correct.
(c) Reason 2 is correct but neither the statement nor the reason 1 are correct.
(d) The statement, the reason 1 and the reason 2 all are not correct.

(6) Let G be an undirected graph such that there exists a unique simple path between two vertices then

(a) Graph must have circuit and loop (b) Graph must have circuit but not loop
(c) Graph must have loop but not circuit (d) Graph neither have circuit nor the loop

(7) If a full-binary tree has 100 leaves then number of edges in the tree

(a) 100 (b) 200 (c) 199 (d) 198

(8) The value of prefix expression: + - ↑ 3 2 ↑ 2 3 / 6 - 4 2 is

(a) 2 (b) 3 (c) 4 (d) 0

(9) The number of non-isomorphic spanning tree of complete graph with three vertices

(a) 1 (b) 3 (c) 6 (d) No such spanning tree exists

(10) Statement 1: All the planar graph has chromatic number less than or equal to four.
Statement 2: Since all the complete bipartite graph have chromatic number 2, that is the reason all the complete bipartite graphs are planar.

(a) Statement 1 is correct but not the statement 2. (b) Statement 2 is correct but not the statement 1.
(c) Statement 1 and the statement 2 both are correct. (d) Neither the Statement 1 nor the statement 2 is correct

CO4, L4

(11) The greatest common divisor of integers 220 and 1575 is
(a) 5 (b) 15 (c) 25 (d) none of above

CO5, L3

(12) The least common multiple of integers 120 and 500 is
(a) 1500 (b) 2500 (c) 300 (d) None of above

CO5, L3

(13) Which one of following is not a prime number

(a) 293 (b)263 (c)2047 (d)1571

CO5, L3

(14) Which of following is not a Mersenne prime
(a) 3 (b)13 (c)31 (d)7

CO3, L3

(15) The remainder when 3^{28} is divided by 5 is
(a) 3 (b) 2 (c) 1 (d) 4

CO3, L3

(16) The number of solutions of congruence $3x \equiv 2\,(mod4)$ is
(a) 2 (b) 1 (c) 3 (d) 0

CO5, L3

(17) The number of solutions of congruence $4x \equiv 3\,(mod2)$ is

(a) 2 (b) 1 (c) 3 (d) 0

CO5, L3

(18) The number of solutions of congruence $3x \equiv 2\,(mod8)$ is

(a) 3 (b) 2 (c) 1 (d) 0

CO5, L3

(19) If the $d = gcd(6, 14)$ is expressed as $6s + 14t$ for some integers s and t, then value of pair (s, t) is

(a) 2,1 (b) 1,-2 (c) -2,1 (d) none of above

CO5, L3

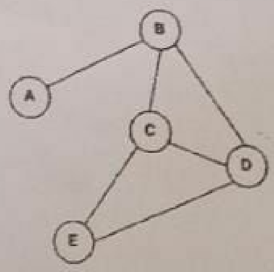
(20) The linear congruence $8x \equiv 10\,(mod6)$ has
(a) Two solutions (b) three solutions (c) no solutions (d) none of above

CO5, L3

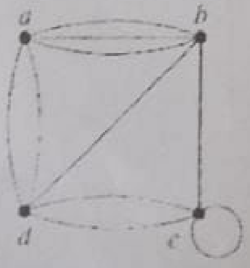
(21) An example of pseudo graph is

(a)

(b)



(c)



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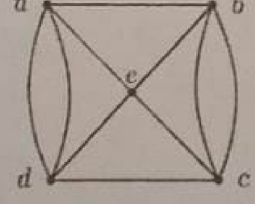


CO4, L4

(28) If a grapg G has 21 edges, 3 vertices of degree 4 and all other vertices of degree 3 then the total number of vertices in G are
(a) 7 (b) 10 (c) 12 (d) 13

(29) The number of edges in complete bipartite graph $K_{3,5}$ is
(a) 16 (b) 15 (c) 8 (d) none of these

(30) Two graphs G_1 an G_2 are not isomorphic if
(a) Number of vertices in G_1 and G_2 are unequal
(b) Number of edges in G_1 and G_2 are unequal
(c) either (a) and (b)
(d) None of these

Part-B

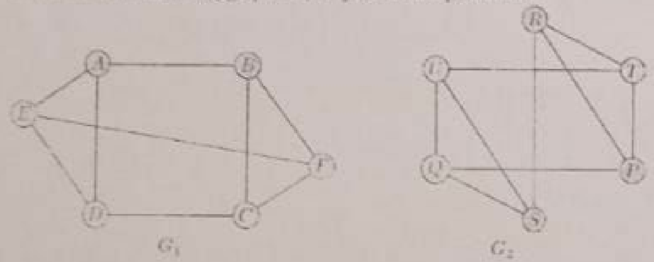
Q2) Find the solution of the recurrence relation $a_n = 4a_{n-1} - 3a_{n-2} + 2^n + n + 3$ with $a_0 = 1$ and $a_1 = 4$.

CO1, L2, [10 marks]

Q3) Sketch the Hasse diagram of $\{1,2,3,4,6,8,12 \mid /\}$. Where / denotes division.

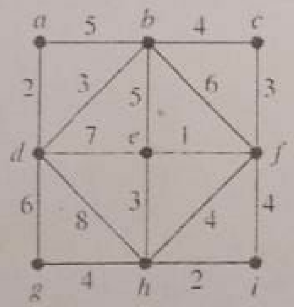
CO3, L3, [10 marks]

Q4) Verify whether following graphs G_1, G_2 are isomorphic or not?



CO4, L4, [10 marks]

Q5) Find a minimum spanning tree for the given weighted graph.



CO4, L4, [10 marks]

Q6) Solve the system by chinee remainder theorem
$x = 5 \pmod{6}$
$x = 3 \pmod{10}$
$x = 8 \pmod{15}$

CO3, L3, [10 marks]

--End of Question paper--

(22) The number of edges in complete graph K_n is

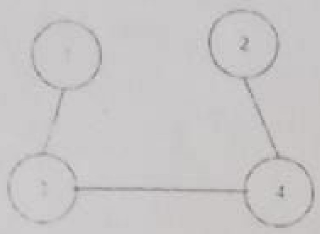
(a) n (b) n(n-1) (c) n-1 (d) $\frac{n(n-1)}{2}$

(23) A regular graph is that graph in which

(a) number of vertices is odd in number (b) number of edges is same as number of vertices

(c) every vertex has loop (d) the degree of each vertex is same

(24) The number of zeros in the adjacency matrix of following graph is



(a) 6 (b) 10 (c) 12 (d) 15

(25) Which of these adjacency matrices represents a simple graph?

a) $\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 1 & 1\end{bmatrix}$ b) $\begin{bmatrix}0 & 0 & 1\\ 1 & 0 & 1\\ 1 & 0 & 0\end{bmatrix}$ c) $\begin{bmatrix}1 & 1 & 1\\ 0 & 1 & 1\\ 1 & 1 & 0\end{bmatrix}$ d) $\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$

(26) Which of the following statement is wrong?

a) A complete bipartite graph $k_{m,n}$ has mn number of edges

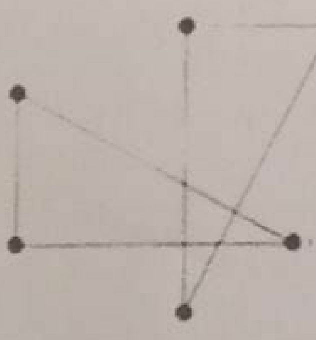
b) A complete bipartite graph $k_{m,n}$ has mn number of vertices

c) Star graph is a special type of bipartite graph

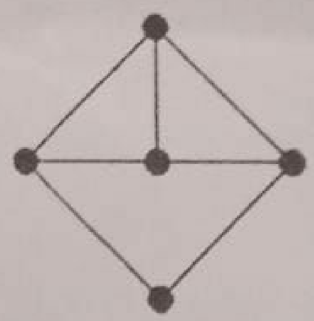
d) A complete bipartite graph $k_{m,n}$ is called regular graph if $m = n$

(27) Which of the following is disconnected graph?

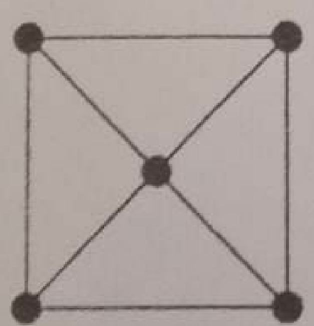
(a)



(b)



(c)



(d)