CLASS: BTECH   SEMESTER : VII
BRANCH: IT//CHEMICAL/CP&P   SESSION : MO/2022

SUBJECT: MA430 DISCRETE MATHEMATICAL STRUCTURES
TIME: 3:00 Hours   FULL MARKS: 50

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)   Let $A = \{1,2,3\}$ and the relation $R = \{(1,1),(2,2),(3,3)\ (1,3),(1,2)\}$. Investigate the relation   [2]
         for reflexive, symmetric or transitive.   BT4   CO1

Q.1(b)   A computer company receives 40 applications for a job of programmers. Among them 25 knew JAVA,   [3]
         28 knew ORACLE, and 7 did not know any of the languages. How many of them knew both the
         languages?   BT3   CO1

Q.1(c)   Find how many different arrangements can be made with the letters of the word 'MATHEMATICS'.   [5]

         How many integer solutions are there in $x + y + z + w - 29$, subject to the constraints
         $x \geq 1, y \geq 2, z \geq 3, w \geq 0$?   BT3   CO1

Q.2(a)   Solve the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 0$, where $a_0 = 2, a_1 = 5$, using   [2]
         characteristic equation method.   BT3   CO4

Q.2(b)   Find the particular solution of the recurrence relation $a_n - 5a_{n-1} + 6a_{n-2} = 1$.   BT1 CO4   [3]

Q.2(c)   Using generating function method, solve the recurrence relation $a_n - 4a_{n-1} + 3a_{n-2} = 0$, with   [5]
         initial condition $a_0 = 2, a_1 = 4$.   BT3   CO4

Q.3(a)   Show that $G = \{e, a, b, c\}$ with the following composition table is a Group.   [5]

	e	a	b	c
e	e	a	b	c
a	a	e	c	b
b	b	c	e	a
c	c	b	a	e

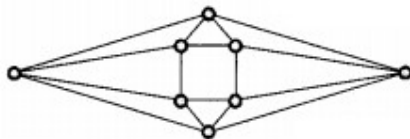   BT3   CO4

Q.3(b)   Find all the subgroups of the above group.   BT1   CO4   [3]
Q.3(c)   State Lagrange's theorem for subgroups.   BT1   CO4   [2]

Q.4(a)   Define Chromatic number of a graph.   BT1   CO5   [2]
Q.4(b)   [3]
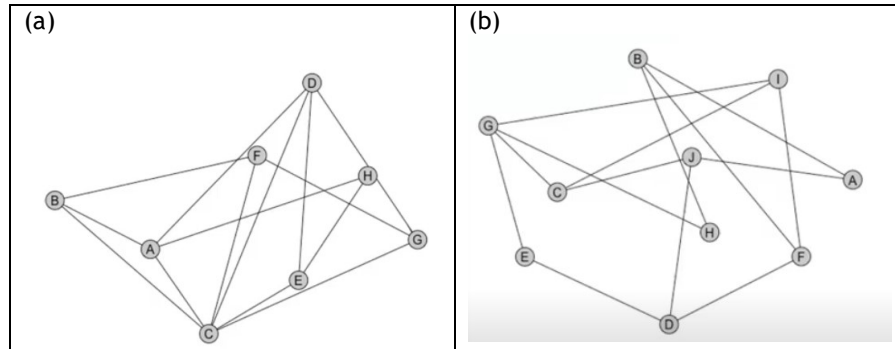

         Compute the Chromatic number of the above graph.   BT3   CO5
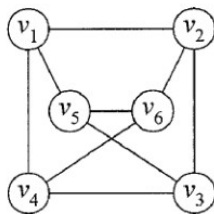
Q.4(c) Compute the chromatic number of the following graphs.   BT3 CO5   [5]

(a)   (b)

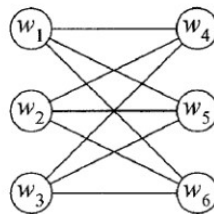Q.5(a) A simple graph G has 10 vertices and 21 edges. Compute the total number of edges in the   [2]
compliment graph $\overline{G}$.   BT3   CO5

Q.5(b) Let G be a graph with n vertices which is isomorphic to its compliment. Show that either $4 \mid n$ [3]
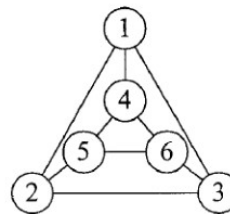or $5 \mid n$.   BT3   CO5

Q.5(c)   [5]

(G$_1$)   (G$_2$)   (G$_3$)

Show that G_1 and G_2 are isomorphic graphs.
Show that G_2 and G_3 are not isomorphic graphs.   BT3 CO5

:::::28/11/2022:::::M