Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES
End Semester Examination, May 2024

Course: Basic Mathematics II **Semester: II**
Program: BCA **Time: 03 hrs.**
Course Code: MATH 1066 **Max. Marks: 100**

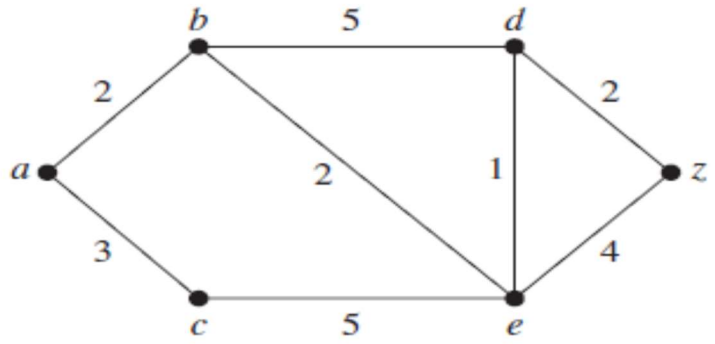
Instructions: Attempt all questions.

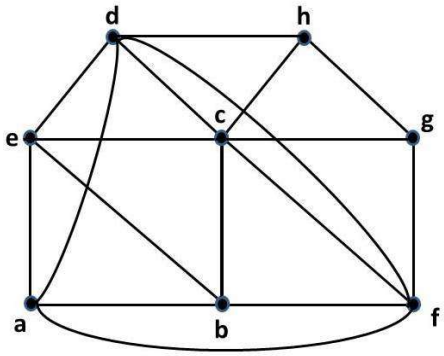
SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	If ω is a complex cube root of unity, prove that $1+\omega+\omega^2=0$.	**4**	**CO1**
Q 2	A drawer contains 12 red and 12 blue socks, all unmatched. A person takes socks out at random in the dark. How many socks must he take out to be sure that he has at least two blue socks?	**4**	**CO2**
Q 3	In a survey on a group of 80 people, it is found that 60 like egg and 30 like fish. Find the percentage of people that like both fish and egg.	**4**	**CO2**
Q 4	Determine the values of x, if $\begin{vmatrix} x+1 & x-1 \\ x-3 & x+2 \end{vmatrix} = \begin{vmatrix} 4 & -1 \\ 1 & 3 \end{vmatrix}$.	**4**	**CO4**
Q 5	Solve $\frac{dy}{dx} = e^{-3x-2y} + x^2 e^{-2y}$.	**4**	**CO4**

SECTION B
(4Qx10M= 40 Marks)

Q 6	Reduce the following matrix into its row echelon form, and hence find its rank. $\begin{bmatrix} 1 & 2 & -1 & 4 \\ 2 & 4 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ -1 & -2 & 6 & -7 \end{bmatrix}$.	**10**	**CO4**
Q 7	Consider the poset $X = \{1, 2, 3, 6, 9, 18\}$ with 'divides' relation. Draw the Hasse diagram of the poset.	**10**	**CO3**
Q 8	When a switch is closed in a circuit containing a battery E, a resistance R and an inductance L, the current i builds up at a rate given by $L\frac{di}{dt} + Ri = E$. Find i as a function of t. How long will it be, before the current has reached one-half its final value if $E = 6$ volts, $R = 100$ ohms and $L = 0.1$ henry?	**10**	**CO4**

Q 9	If $a+b+c=0$, Solve $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} = 0$ **OR** Investigate the values of m and n so that the equations $x+2y+z=4;\ x+y+z=6;\ x-2y+m\,z=n$ have **(i)** no solution, **(ii)** a unique solution and **(iii)** an infinite number of solutions.	**10**	**CO4**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	a) If R is a relation in the set of integers Z defined by $R = \{(x,y): x \in Z, y \in Z, (x-y)$ is divisible by $6\}$ then prove that: i) R is an equivalence relation. ii) R is not a partial order set. b) Write the converse, inverse and contrapositive of the following statements: i) If you are intelligent, then you will pass the exam. ii) I will dance only if you sing.	**20**	**CO2**
Q 11	Using Dijkstra's algorithm, determine the length of the shortest path and hence the shortest path in the following graphs from a to z.  **OR** Define vertex colouring. Explain Welch-Powell algorithm and using this algorithm determine the coloring of the graph as shown below and hence determine the chromatic number $\chi(G)$.	**20**	**CO3**

	 d h c g e a b f		