


Name:			
Enrolment No:			
<div><div>UPES</div><div>End Semester Examination, May 2025</div><div><div>Course: Basic Mathematics II</div><div>Program: BCA</div><div>Course Code: MATH 1066</div></div><div><div>Semester: II</div><div>Time: 03 hrs.</div><div>Max. Marks: 100</div></div></div>			
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 $\omega^3 + \omega^4 + \omega^5 = 0$.	4	CO1
Q 2	A bag contains 10 red marbles, 10 white marbles, and 10 blue marbles. What is the minimum no. of marbles you have to choose randomly from the bag to ensure that we get 4 marbles of the same color?	4	CO2
Q 3	In class, students want to join sports. 15 people will join football, 24 people will join basketball, and 7 people will join both. How many people are there in the class?	4	CO2
Q 4	Determine the value of x , for which the given matrix become singular $\begin{bmatrix} 8 & x & 0 \\ 4 & 0 & 2 \\ 12 & 6 & 0 \end{bmatrix}$.	4	CO4
Q 5	Solve the differential equation $xy^2 \frac{dy}{dx} = 1 - x^2 + y^2 - x^2y^2$.	4	CO4
SECTION B (4Qx10M= 40 Marks)			
Q 6	Reduce the following matrix into its row echelon form and hence find its rank. $\begin{bmatrix} 1 & 2 & 4 \\ 2 & 4 & 3 \\ 2 & 7 & 9 \\ 3 & 6 & 7 \end{bmatrix}$.	10	CO4
Q 7	Consider the poset $X = \{1, 2, 5, 8, 10, 15, 30\}$ 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 .	10	CO4

Q 9	<p>The cost of 4 kg onion, 3 kg wheat and 2 kg rice is Rs 60. The cost of 2 kg onion, 4 kg wheat and 6 kg rice is Rs 90. The cost of 6 kg onion, 2 kg wheat and 3 kg rice is Rs 70. Find the cost of each item per kg by Gauss elimination method.</p> <p style="text-align: center;">OR</p> <p>Investigate the values of m and n so that the equations $x + 2y + z = 4$; $x + y + z = 6$; $x - 2y + mz = n$ have (i) no solution, (ii) a unique solution and (iii) an infinite number of solutions.</p>	10	CO4
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SECTION-C
(2Qx20M=40 Marks)

Q 10	<p>a) Given, set $A = \{1,2,3\}$. Give an example of a relation R defined on the set A, which is:</p> <p>(i) reflexive and transitive but not symmetric (ii) symmetric and transitive but not reflexive (iii) reflexive and symmetric but not transitive.</p> <p>b) If p, q and r are three statements, construct the Truth Table of the following propositions</p> <p>(i) $p \wedge \sim q \vee r$ (ii) $r \wedge \sim(p \vee q)$</p>	20	CO2
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Q 11	<p>Apply Dijkstra's algorithm to determine the length of the shortest path and hence find the shortest path in the following graphs from D to F:</p> <p style="text-align: center;">OR</p> <p>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 $\chi(G)$.</p>	20	CO3
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