



MANGALORE INSTITUTE OF TECHNOLOGY & ENGINEERING

(A Unit of Rajalaxmi Education Trust®, Mangalore)
Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE, New Delhi
Accredited by NAAC with A+ Grade & ISO 9001:2015 Certified Institution

Model Question Paper

Mathematical Foundation for Computer Applications

Duration: 3 hrs.

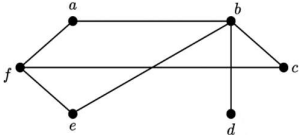
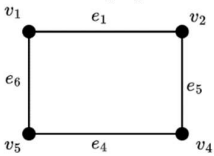
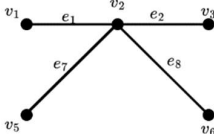
Semester: 01

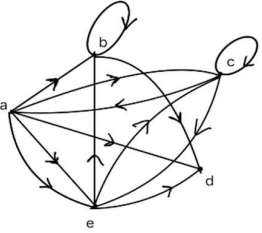
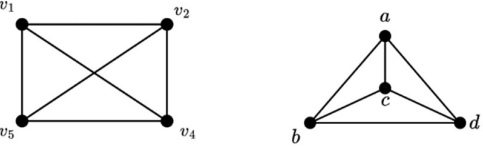
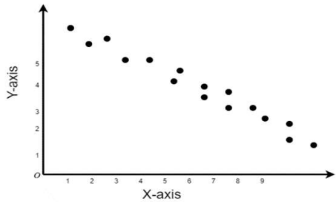
Section: MCA

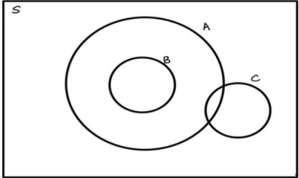
Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Q. No.	Question	Course Outcome (CO)	Revised Bloom's Taxonomy Level	Marks
Module- 1				
1a	i. Given $A = \{1, 2, 3, 4, 5\}$. Determine whether $\{2\} \subseteq A$, $4 \in A$, $\{4\} \in A$, $\phi \subseteq A$. ii. Determine whether or not $A = \{x : x \in \mathbb{Z}, x \text{ is a root of } x^2 - 3 = 0\}$ is an empty set. iii. Represent $A = \{x : x \in \mathbb{N}, 1 \leq x \leq 5\}$ in roster form.	CO1	L3	6
1b	Let $A = \{x \in \mathbb{Z} : x \text{ is a multiple of } 2 \text{ and } -5 \leq x \leq 10\}$, $B = \{x \in \mathbb{U} : -5 \leq x \leq 10, x \text{ is a multiple of } 3\}$, $C = \{x \in \mathbb{Z} : -5 \leq x \leq 10, x > 0\}$. Examine whether $A \cup (B \cap C) = (A \cup C) \cap (B \cup C)$ holds.	CO2	L3	7
1c	There are 500 employees in a company, out of which 193 know Hindi, 200 know Kannada, and 120 know neither Hindi nor Kannada. Apply appropriate principle to determine the number of employees who know both Kannada and Hindi. Also determine the number of students who know only Kannada.	CO3	L3	7
OR				
2a	Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c, d\}$. Let $f_1 = \{(1, b), (2, b), (3, c), (4, c)\}$ $f_2 = \{(1, c), (2, d), (3, a), (4, c)\}$ be two functions from A to B . i. Determine the pre-image of c under f_1 . ii. Determine the image of 2 under f_2 . iii. Determine whether f_1 is one-one. iv. Determine whether f_2 is onto. v. Determine the range, co-domain of f_1 .	CO1	L3	6
2b	Let $A = \{1, 2, 3, 4, 5, 6\}$ be a set and R be a relation on A be defined by $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4), (5, 5), (6, 6), (3, 4), (4, 3), (4, 5), (4, 5), (3, 5), (5, 3)\}$. i. Represent the relation using a digraph and relation matrix. ii. Examine whether R is an equivalence relation or not.	CO2	L3	7
2c	In a survey of 260 computer science students, the following data were obtained: 154 like USA, 128 like UK and 36 like both the countries. Apply appropriate principle to determine i. How many students like none of the two countries. ii. How many students like only USA.	CO3	L3	7
Module-2				
3a	i. Determine whether or not the following are proposition. Justify your answer a. $x + 2 = 11$ b. Mysore is the capital of Karnataka. ii. Negate the statement "My phone has at-least 32GB of memory" iii. In each of the following determine all the possible combination of truth values of the variables p, q, r so that the following hold i. $p \vee q \vee r$ is false ii. $p \Rightarrow (q \vee r)$ is false	CO1	L3	6
3b	Apply the principle of mathematical induction to verify that $1 + 2^n < 3^n$ for $n \geq 2$	CO2	L3	7

3c	Apply rules of inference to determine whether the following argument is valid or not. “No people who live in city A or city B are educated”, “Anjali is educated” leads to the conclusion “Anjali does not live in city B”.	CO3	L3	7
OR				
4a	i. Let $P(x)$: “ x is an integer” be a propositional function. Determine the truth value of $P(2.4)$ ii. Let p and q be the propositions “It is sunny” and “We plan a trip” respectively. Determine the corresponding propositions in words. i. $p \Rightarrow q$ ii. $\neg q \Rightarrow \neg p$. iii. Determine whether the argument is valid or not. Justify $\frac{q}{p \Rightarrow q}$ $\therefore p$	CO1	L3	6
4b	Construct the truth table of the compound proposition $((p \vee \neg q) \Rightarrow r) \Rightarrow (p \Rightarrow (q \wedge r))$	CO2	L3	7
4c	Apply appropriate rules of inference to verify whether the hypotheses " If I study, I will not fail in the examination", "If I do not watch TV in the evenings, I will study", "I failed in the examination" lead to the conclusion "I have watched TV in the evenings".	CO3	L3	7
Module-3				
5a	 <p>i) Determine the degree of vertex b. ii) Determine a cut vertex and a bridge. iii) Determine the pendant vertices. iv) Give an example of a spanning tree for the given graph. v) Give a path of length 3 from f to c.</p>	CO1	L3	6
5b	Consider the graphs   <p>i) Find incidence matrix of G_1 ii) Determine $G_2 - \{e_7\}$ iii) Determine $G_1 - \{v_1\}$ iv) Determine the graph $G_1 \cup G_2$.</p>	CO2	L3	7
5c	Develop a graph model for the list of airline routes connecting various cities as follows: Airline route connecting cities A and E , A and C , E and C , E and F , C and F , C and B , F and B . Also, find the shortest route from city A to city F by boarding least number of planes.	CO3	L3	7
OR				

<p>6a</p>	<p>Consider the graph.</p>  <p>i. Determine parallel edges and loops. ii. Determine the indegree of b, c. iii. Determine whether there is a path from c to b iv. Determine the vertices which are adjacent to e</p>	<p>CO1</p>	<p>L3</p>	<p>6</p>																																	
<p>6b</p>	<p>i. Determine whether or not, the following graphs are isomorphic</p>  <p>Graph G_1 Graph G_2</p> <p>ii. Determine the graph represented by the following adjacency matrix and find its complement graph.</p> $\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$	<p>CO2</p>	<p>L3</p>	<p>7</p>																																	
<p>6c</p>	<p>A person A is planning to organize a social event by inviting a group of people who are connected through a social network. It is observed that A and B, B and C, B and D, D and C, C and E, D and E are connected through this network. Model this using a graph and find an easiest way for the person A to reach out to person F.</p>	<p>CO3</p>	<p>L3</p>	<p>7</p>																																	
<p>Module-4</p>																																					
<p>7a</p>	<p>i. Construct scatter diagrams which depict negative and zero correlation. ii. Given the slope of regression lines $b_{xy} = -1, b_{yx} = -1$, find r and determine whether the correlation is positive or negative. iii. Determine whether the slopes of regression lines can be of opposite sign. Justify your answer.</p>	<p>CO1</p>	<p>L3</p>	<p>6</p>																																	
<p>7b</p>	<p>Fit a parabola $y = a + bx + cx^2$ to the given data</p> <table border="1" data-bbox="259 1218 966 1281"> <tr> <td>x</td> <td>10</td> <td>12</td> <td>15</td> <td>23</td> <td>20</td> </tr> <tr> <td>y</td> <td>14</td> <td>17</td> <td>23</td> <td>25</td> <td>21</td> </tr> </table>	x	10	12	15	23	20	y	14	17	23	25	21	<p>CO2</p>	<p>L3</p>	<p>7</p>																					
x	10	12	15	23	20																																
y	14	17	23	25	21																																
<p>7c</p>	<p>Ten competitors in music contest are ranked by 3 judges A, B, C in the following order. Use the rank correlation coefficient to decide which pair of judges have the nearest approach to common taste of music</p> <table border="1" data-bbox="259 1396 1079 1491"> <tr> <td>A</td> <td>1</td> <td>6</td> <td>5</td> <td>10</td> <td>3</td> <td>2</td> <td>4</td> <td>9</td> <td>7</td> <td>8</td> </tr> <tr> <td>B</td> <td>5</td> <td>3</td> <td>8</td> <td>4</td> <td>7</td> <td>10</td> <td>2</td> <td>1</td> <td>6</td> <td>9</td> </tr> <tr> <td>C</td> <td>6</td> <td>4</td> <td>9</td> <td>8</td> <td>1</td> <td>2</td> <td>3</td> <td>10</td> <td>5</td> <td>7</td> </tr> </table>	A	1	6	5	10	3	2	4	9	7	8	B	5	3	8	4	7	10	2	1	6	9	C	6	4	9	8	1	2	3	10	5	7	<p>CO3</p>	<p>L3</p>	<p>7</p>
A	1	6	5	10	3	2	4	9	7	8																											
B	5	3	8	4	7	10	2	1	6	9																											
C	6	4	9	8	1	2	3	10	5	7																											
<p>OR</p>																																					
<p>8a</p>	<p>i. In the following diagram, determine the sign of the correlation coefficient. Justify your answer.</p>  <p>ii. Give a scatter diagram for which correlation coefficient between variables is positive. iii. Whether or not $-3.5, -0.5$ can be a correlation coefficient for any set of data? Justify your answer</p>	<p>CO1</p>	<p>L3</p>	<p>6</p>																																	

8b	<p>Find the correlation coefficient for the following two groups. Also determine lines of regression.</p> <table border="1" data-bbox="261 212 1078 275"> <tbody> <tr> <td>x</td> <td>9</td> <td>8</td> <td>7</td> <td>6</td> <td>5</td> <td>4</td> <td>3</td> <td>2</td> <td>1</td> </tr> <tr> <td>y</td> <td>15</td> <td>16</td> <td>14</td> <td>13</td> <td>11</td> <td>12</td> <td>10</td> <td>8</td> <td>9</td> </tr> </tbody> </table>	x	9	8	7	6	5	4	3	2	1	y	15	16	14	13	11	12	10	8	9	CO2	L3	7
x	9	8	7	6	5	4	3	2	1															
y	15	16	14	13	11	12	10	8	9															
8c	<p>If P is the pull required to lift a load W by means of a pulley block. Find a linear law of the form $P = mW + c$ connecting P and W using the following data where P and W are taken in $kg\ wt$, Compute P when $W = 150\ kg\ wt$.</p> <table border="1" data-bbox="261 390 1078 453"> <tbody> <tr> <td>P</td> <td>12</td> <td>15</td> <td>21</td> <td>25</td> </tr> <tr> <td>W</td> <td>50</td> <td>70</td> <td>100</td> <td>120</td> </tr> </tbody> </table>	P	12	15	21	25	W	50	70	100	120	CO3	L3	7										
P	12	15	21	25																				
W	50	70	100	120																				
Module-5																								
9a	<div style="text-align: center;">  </div> <p>i. If $B \subset A$, then write the relation between their probabilities. ii. Whether A and B are mutually exclusive events? Justify. iii. $P(A B) = 1$. True/ false justify. iv. Give a condition on $P(C)$ such that $P(A C)$ is defined.</p>	CO1	L3	6																				
9b	<p>Let A and B be two events such that $P(A) = 0.3$, $P(B) = 0.5$ and $P(A \cup B) = 0.7$. Find</p> <p>i. $P(A B)$ ii. $P(\bar{A} \cup \bar{B})$</p>	CO2	L3	7																				
9c	<p>A company has two plants to manufacture scooters. Plant 1 manufactures 80% of the scooters and plant 2 manufactures 20%. At plant 1, 85 out of 100 scooters are rated standard quality or better. At plant 2, only 65 out of 100 scooters are rated standard quality or better.</p> <p>1. Determine the probability that scooter selected at random came from plant 1, if it is known that scooter is of standard quality. 2. Determine the probability that the scooter came from plant 2, if it is known that scooter is of standard quality.</p>	CO3	L3	7																				
OR																								
10a	<p>Tickets are numbered from 1 to 20. They are well shuffled and a ticket is drawn at random. The following be few events A: getting an even number, B: getting a number which is multiple of 5, C: getting a number which is greater than 15.</p> <p>a. Construct a Venn diagram representing these events. b. Determine whether A and B are mutually exclusive. Justify your answer. c. Determine a ticket number which is favorable to all the events A, B, C. d. Give the mathematical expression to find the probability of getting an even number given that it is a multiple of 5.</p>	CO1	L3	6																				
10b	<p>Let X, Y, Z be mutually exclusive and collectively exhaustive events with probabilities being equally likely. Let B be any arbitrary event with conditional probabilities $P(B X) = 0.02$, $P(B Y) = 0.07$, $P(B Z) = 0.12$.</p> <p>i. Determine $P(Y \cap B)$. ii. Determine $P(Y B)$ using Baye's theorem.</p>	CO2	L3	7																				
10c	<p>A box of 100 mobiles containing mobiles contains 10 mobiles with defect type A, 5 mobiles with defect type B and 2 mobiles with both types of defects. Find the probabilities that</p> <p>i. A mobile drawn has a type B defect under the condition that it has a type A defect. ii. A mobile drawn has no type B defect under the condition that it has no type A defect.</p>	CO3	L3	7																				
