

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST SEMESTER MCA DEGREE EXAMINATION, DECEMBER 2017

Course Code: RLMCA103

Course Name: DISCRETE MATHEMATICS

Max. Marks: 60

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

- | | | |
|---|--|-----|
| 1 | Show that $(A \cup B)' = A' \cap B'$ | (3) |
| 2 | Find GCD(12378, 3054) | (3) |
| 3 | Find the number of arrangements of letters of the word MISSISSIPPI in which the 4 I's come together | (3) |
| 4 | Find a_{12} when $a_{n+1}^2 = 5a_n^2$ with $a_0 = 2$ | (3) |
| 5 | Define Regular graph and Connected graph with example | (3) |
| 6 | A connected planar graph has 9 vertices having degrees 2, 2, 2, 3, 3, 3, 4, 4, 5. Find the number of edges and faces | (3) |
| 7 | Define Tautology and show that $(p \wedge q) \rightarrow p$ is a tautology | (3) |
| 8 | Show that $p \rightarrow q$ and $\sim p \vee q$ are logically equivalent | (3) |

PART B

Answer six questions, one full question from each module and carries 6 marks.

Module I

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|---|--|-----|
| 9 | a) Define equivalence relation | (1) |
| | b) Prove that for $x, y \in \mathbb{Z}$ the relation defined by $R = \{(x, y) : 5 \text{ divides } x - y\}$ is an equivalence relation | (5) |

OR

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|----|--|-----|
| 10 | a) Let $f: \mathbb{R} \rightarrow \mathbb{R}$ defined by $f(x) = x + 2$ and $g(x) = x^2$. Find $g \circ f$ and $f \circ g$ | (2) |
| | b) Let $f: \mathbb{R} - \{3\} \rightarrow \mathbb{R} - \{1\}$ defined by $f(x) = \frac{x-2}{x-3}$. Check whether f is bijective | (4) |

Module II

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|----|---|-----|
| 11 | Solve the linear Diophantine equation $172x + 20y = 1000$ | (6) |
|----|---|-----|

OR

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|----|---|-----|
| 12 | Solve the set of simultaneous congruences $x \equiv 2 \pmod{3}$, $x \equiv 3 \pmod{5}$, $x \equiv 2 \pmod{7}$ | (6) |
|----|---|-----|

Module III

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|----|--|-----|
| 13 | a) Determine all integer solutions to the equation $x_1 + x_2 + x_3 + x_4 = 7$ | (2) |
| | b) A committee of 10 people is to be formed from 12 men and 8 women. In how many ways can the committee be formed if | (4) |
| | i) There should be an even number of men | |
| | ii) There should be at least 8 men | |

OR

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|----|--|-----|
| 14 | a) Find the coefficient of $x^2 y^3 z^4$ in the expansion of $(x + y + z)^9$ | (2) |
|----|--|-----|

- b) Define Pigeonhole principle. Show that in a group of 6 people, where any two people are either friends or Strangers, there are either 3 mutual friends or 3 mutual strangers (4)

Module IV

- 15 Solve $a_r + a_{r-1} = 3r(2)^r$ (6)

OR

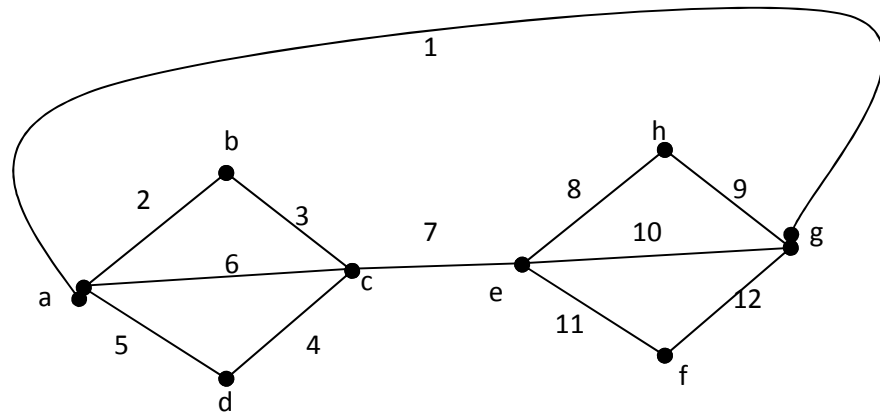
- 16 Solve $a_{n+2} - 4a_{n+1} + 3a_n = -200$, $n \geq 0$; given that $a_0 = 3000$, $a_1 = 3300$ (6)

Module V

- 17 Let $G = (V, E)$ be an undirected graph or multi graph with no isolated vertices. Show that G has an Euler circuit if and only if G is connected and every vertex in G has even degree (6)

OR

- 18 Use Fleury's algorithm to find an Euler circuit for the following graph (6)



Module VI

- 19 a) Translate the sentence into a logical expression: "You cannot access the internet from campus only if you are a computer science major or you are not a freshman" (2)
- b) Show that the following argument is valid: "If today is Monday, I have a test in Physics or Mathematics. If my Physics professor is sick, I will not have a test in Physics. Today is Monday and my Physics professor is sick. Therefore I have a test in Mathematics" (4)

OR

- 20 a) Negate the statement in logical form "There is an honest student". (2)
- b) Use rules of inference to show that $\exists xM(x)$ follows logically from the premises $(x)(H(x) \rightarrow M(x))$ and $\exists xH(x)$ (4)
