

Reg. No. _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**FIRST SEMESTER REGULAR MCA DEGREE EXAMINATION, JULY 2017****RLMCA103: DISCRETE MATHEMATICS**

Max Marks: 60

Duration: 3 Hours

PART A*Answer All Questions. Each question carries 3 marks.*

1. Show that $(A \cup B)' = A' \cap B'$
2. Find $\text{GCD}(256, 18)$
3. Find the number of arrangements of letters of the word MISSISSIPPI in which the 4 I's come together.
4. Find a_{12} when $a_{n+1}^2 = 5a_n^2$ with $a_0 = 2$.
5. Define Regular graph and Connected graph with example.
6. A connected planar graph has 9 vertices having degrees 2, 2, 2, 3, 3, 3, 3, 4, 4, 5. How many edges are there? How many regions are there?
7. Define Tautology and show that $(p \wedge q) \rightarrow p$ is a tautology.
8. Show that $p \rightarrow q$ and $\sim p \vee q$ are logically equivalent.

PART B*Answer All Questions. Each question carries 6 marks.***MODULE I**

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

OR

10. Let $f: \mathbb{R} - \{3\} \rightarrow \mathbb{R} - \{1\}$ defined by $f(x) = \frac{x-2}{x-3}$. Check whether f is bijective? Find the inverse if any.

MODULE II

11. Solve the linear Diophantine equation $172x + 20y = 1000$.

OR

12. Solve the set of simultaneous congruences $x \equiv 2 \pmod{3}$, $x \equiv 3 \pmod{5}$, $x \equiv 2 \pmod{7}$

MODULE III

13. 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

- (a) There are no restrictions.
- (b) There must be 5 men and 5 women.
- (c) There should be an even number of men.
- (d) There should be at least 8 men.

OR

14. (i) Define Pigeonhole principle. Consider any group of 6 people, where any two people are either friends or enemies, then show that there are either 3 mutual friends or 3 mutual enemies.
- (ii) Find the coefficient of $x^2y^3z^4$ in the expansion of $(x + y + z)^9$

MODULE IV

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

OR

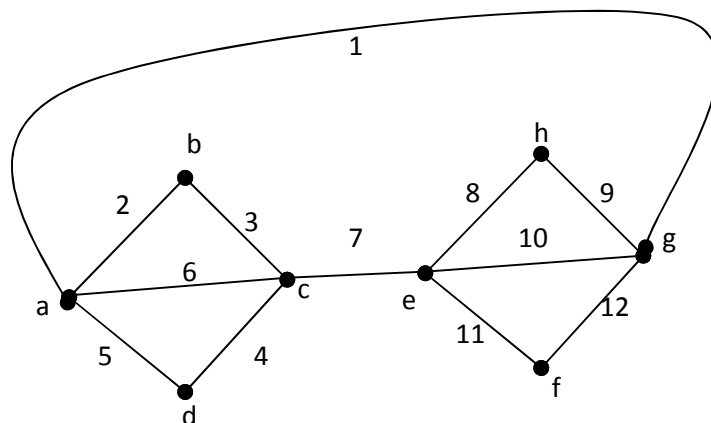
16. Solve $a_{n+2} - 4a_{n+1} + 3a_n = -200$, $n \geq 0$; given that $a_0 = 3000$, $a_1 = 3300$.

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.

OR

18. Use Fleury's algorithm to find an Euler circuit for the following graph.



MODULE VI

19. 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"

OR

20. Use rules of inference to show that $\exists xM(x)$ follows logically from the premises $(x)(H(x) \rightarrow M(x))$ and $\exists xH(x)$.
