Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER MCA DEGREE EXAMINATION, JULY 2018

Course Code: RLMCA103

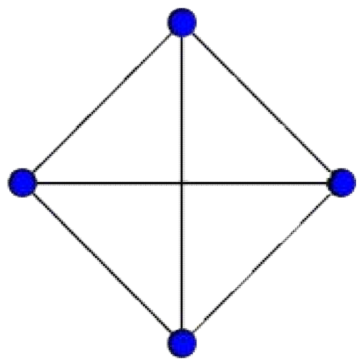
Course Name: DISCRETE MATHEMATICS

Max. Marks: 60 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks Marks

1		Define antisymmetric relation with an example.	(3)
2		Let A={1,2,3,4} and R={(1,1),(1,4),(4,1),(4,4),(2,2),(2,3),(3,2),(3,3)}. Write the matrix of R and sketch its graph.	(3)
3		State Chinese Remainder theorem.	(3)
4		How many arrangements are there of all letters in the word SOCIOLOGICAL?	(3)
5		Define Bipartite graph and Complete graph. Can a bipartite graph be complete?	(3)
6		Define planar graph. Check whether the graph given below is planar. If yes, draw the planar embedding.	(3)



7		Let p: Triangle ABC is isosceles. Q: Triangle ABC is equilateral. Translate the statement $\sim p \rightarrow \sim q$ into an English sentence.	(3)
8		If p, q are primitive statements, prove that $(\sim p \vee q) \wedge (p \wedge (p \wedge q)) \Leftrightarrow (p \wedge q)$.	(3)

PART B

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

Module I

9		Let U={1,2,3,4,5,6,7}, A={1,2,3,4,7}, B={2,3,4,5,6}. Verify DeMorgan's laws.	(6)
		OR	
10		Prove that if $f : A \rightarrow B$ and $g : B \rightarrow C$ are both one-one and onto , then $g \circ f$ is also one-one and onto. Also prove that $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$.	(6)
		Module II	
11		Write the gcd(12378,3054) as the linear combination of the two numbers.	(6)
		OR	
12		Show that 41 divides $2^{20}-1$ using properties of congruences.	(6)
		Module III	
13	a)	A student is to answer 7 out of 10 questions on an examination. In how many	(3)

ways can he make his selection if he must answer the first two questions.

b) If he must answer at least four of the first six questions. (3)

OR

14 Determine the number of positive integers n where $1 \le n \le 100$ and n is not divisible by 2,3 or 5. (6)

Module IV

15 Solve the recurrence relation $a_n = 5\, a_{n-1} + 6\, a_{n-2}$, $n \ge 2$, $a_0 = 1$, $a_1 = 3$. (6)

OR

16 Solve $a_{n+2} + 3\, a_{n+1} + 2\, a_n = 3^n$, $n \ge 0$, $a_0 = 0$, $a_1 = 1$. (6)

Module V

17 a) Show that the number of odd vertices in a graph is even. (3)

b) Is it true that the number of even vertices in a graph is odd? Justify your answer with an example. (3)

OR

18 a) Define Euler graph with an example. (3)

b) Define Hamiltonian graph with an example. (3)

Module VI

19 Write the contrapositive, converse and inverse of the statement: (6)

$\forall x\, [p(x) \rightarrow (r(x) \vee q(x))]$.

OR

20 Establish the validity of the argument: (6)

$$\begin{array}{l} p \rightarrow r \\ \sim p \rightarrow q \\ q \rightarrow s \\ \hline \therefore \sim r \rightarrow s \end{array}$$

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