Q.P. CODE 12161

First Semester B.C.A. Degree Examination

October / November 2018

(2016-17 Syllabus)

BCA 410 : MATHEMATICS I FOR COMPUTER APPLICATIONS

Time : 3 Hours Max. Marks : 80

PART - I

Answer ALL questions: **5x1=5**

1. Define injective function.
2. If p, q, r are propositions with truth values T, F, T respectively, determine the truth value of $p \leftrightarrow (q \rightarrow r)$
3. Find $^7P_3$
4. Define scalar matrix.
5. Find $\begin{vmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{vmatrix}$

PART - II

Answer any FIVE of the following: **5x15=75**

6. a) If U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, A = {1, 2, 3, 4} B= {4, 5, 6},

   Then verify (i) $(A \cup B)' = A' \cap B'$

   (ii) $(A \cap B)' = A' \cup B'$ and draw venn diagram **(5)**

   b) If U = {1, 2, 3, 4, 5, 6, 7, 8}, A = {5, 3, 6, 7} B= {3, 4, 8}, C= {2, 6, 7},

   Then find (i) $(A \cap B) \times (A-C)$

   (ii) $(A \cap C)'$

   (iii) $(A-B) \cup (B-A)$ **(5)**

   c) i. Define Reflexive relation and give an example.

   ii. Give an example of a relation which is reflexive and symmetric but not transitive.

   iii. Define floor function. **(5)**

7. a) Prove that $[(p \rightarrow q) \wedge (q \rightarrow r)] \rightarrow (q \rightarrow r)$ is a Tautology. **(5)**

   b) Show that $\sim(\sim p \rightarrow \sim q) \equiv \sim p \wedge q$ **(5)**

c) Write the converse, inverse and contrapositive of the statement "If two integers are equal then their squares are equal" **(5)**

8. a) Write down the negation of the proposition "If x is not a real number, then it is not a rational number and not an irrational number" **(5)**

b) If p(x) and q(x) are open sentences with the same replacement set, then prove that

$T[\,p(x) \wedge q(x)] = T[p(x)] \cap T[q(x)]$ **(5)**

c) Write down the following proposition in Symbolic form and hence find its negation. "All integers are rational numbers and some rational numbers are integers". **(5)**

9. a) Prove by principle of mathematical induction that "the product of two consecutive natural numbers is an even number". **(5)**

b) If ${}^{n}p_{4} = 24 \times {}^{n}C_{5}$, find n **(5)**

c) State and prove Pigeonhole Principle. **(5+5+5)**

10. a) If $A = \begin{bmatrix} 4 & 3 & 2 \\ 2 & 2 & 1 \\ 1 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 6 & 2 \\ 2 & 8 & 2 \\ 3 & 3 & 2 \end{bmatrix}$

then find 3A - 2B & 2A + 3B **(5)**

b) If $A = \begin{bmatrix} 1 & 3 & 5 \\ 2 & 4 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 8 & 5 & 3 \\ 2 & 4 & 6 \end{bmatrix}$, then find the matrix X such that

4A + X = 2B **(5)**

c) If $A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & -2 & -1 \\ 6 & 12 & 6 \\ 5 & 10 & 15 \end{bmatrix}$, find AB and BA **(5)**

11. a) If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 & 1 \\ 1 & 3 & 2 \end{bmatrix}$

then prove that $(A+B)' = A' + B'$ **(5)**

b) Find x, y and z if

$$\begin{bmatrix} x & 2 & -3 \\ 5 & y & 2 \\ 1 & -1 & z \end{bmatrix} * \begin{bmatrix} 3 & -1 & 2 \\ 4 & 2 & 5 \\ 2 & 0 & 3 \end{bmatrix} = \begin{bmatrix} 5 & 3 & 3 \\ 19 & -5 & 16 \\ 1 & -3 & 0 \end{bmatrix}$$ **(5)**

c) Find the inverse of the matrix

$$A = \begin{bmatrix} -3 & 5 & -1 \\ 4 & -1 & 2 \\ 0 & 8 & -2 \end{bmatrix}$$ **(5)**

12. a) Find X if $\begin{vmatrix} 2 & x & 3 \\ 4 & 1 & 6 \\ -1 & 2 & 7 \end{vmatrix} = 0$ **(5)**

b) Solve : $2x + y + z = 7$

$3x - y – 2 = -2$

$x + 2y - 3z = -4$

by Cramer's rule **(5)**

c) Test the consistency of the following system

$x + y - 2z = 5$

$x - 2y + z = -2$

$-2x + y + z = 4$ **(5)**

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