BC-101

B.C.A. (Part I) Examination, 2017

FUNDAMENTAL MATHEMATICS FOR COMPUTER APPLICATION

Paper: BCA-101

Time allowed : Three hours

Maximum Marks : 50

Attempt any five questions in all, selecting at least one question from each Unit. All questions carry equal marks.

UNIT – I

1. (a) Find the rank of following matrix, A [5]

$$A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 1 \\ 2 & 7 & 8 \end{bmatrix}$$

(b) Prove that [5]

$$\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = (a-b)(b-c)(c-a)$$

2. (a) What do you mean by Hermitian matrix ? Show that following matrix is Hermitian. [1 + 4]

$$A = \begin{bmatrix} 1 & 1-i & 2 \\ 1+i & 3 & i \\ 2 & -i & 0 \end{bmatrix}$$

(b) Solve the following system of linear equation by Cramer's rule [5]

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

$$x - y - z = 0$$

$$x + 2y + z = 0$$

UNIT – II

3. (a) (i) Find the positive integer n so that [2 × 2.5]

$$\lim_{x \to 3} \frac{x^n - 3^n}{x - 3} = 108$$

(ii) Evaluate $\lim_{x \to 2} \left[\frac{1}{x-2} - \frac{2(2x-3)}{x^3 - 3x^2 + 2x} \right]$

(b) Find the derivative of $\frac{\cos x}{1 + \sin x}$ with respect to x. [5]

4. (a) The total revenue in rupees received from the sale of x units of a product is given by $R(x) = 3x^2 + 36x + 5$. Find the marginal revenue, when x = 5, where by marginal revenue we mean the rate of change of total revenue w.r.t. the number of items sold at an instant. [5]

(b) Find the maximum profit that a company can make, if the profit function is given by $P(x) = 41 - 72x - 18x^2$. [5]

UNIT – III

5. (a) Evaluate $\int \frac{x^3 - 1}{x^2} dx$ [5]

(b) Evaluate $\int \frac{\sin\left(\tan^{-1} x\right)}{1 + x^2} dx$ [5]

6. (a) Evaluate $\int \frac{x^2 + 1}{x^2 - 5x + 6} dx$ [5]

(b) Evaluate $\int \frac{\left(x^2 + 1\right) e^x}{(x+1)^2} dx$ [5]

UNIT – IV

7. (a) Find the equation of line which passes through the point (2, 3) and makes an angle of 30° with the positive direction of x-axis. [5]

(b) Calculate the center co-ordinates and radius of a circle given by following equation. [5]

$$x^2 + y^2 - 4x - 6y - 12 = 0$$

8. (a) Find the distance between the lines 3x + 4y = 9 and 6x + 8y = 15. [5]

(b) Find the equation of straight line passing through (1, 2) and perpendicular to the line $x + y + 7 = 0$ [5]

UNIT – V

9. (a) Find a vector in the direction of vector $\vec{a} = \hat{i} - 2\hat{j}$ that has magnitude 7 units. [5]

(b) If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular. [5]

10. (a) Find $|\vec{a} \times \vec{b}|$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$ and $\vec{b} = 3\hat{i} + 5\hat{j} - 2\hat{k}$. [5]

(b) Show that the points $A(-2\hat{i} + 3\hat{j} + 5\hat{k})$, $B(\hat{i} + 2\hat{j} + 3\hat{k})$ and $C(7\hat{i} - \hat{k})$ are collinear. [5]

श्री जैन (पी.जी.) कॉलेज, बीकानेर

BC - 331

BCA (Part-I) Examination, 2018

BCA-101

(Mathematics for Computer Science)

Time allowed : Three hours

Maximum Marks : 70

SECTION - A **(Marks 2 × 10 = 20)**

Answer all **ten** questions. (Answer limit 50 words) Each question carries 02 marks.

SECTION - B **(Marks 4 × 5 = 20)**

Answer all **five** questions. Each question has internal choice. (Answer limit 200 words) Each question carries 04 marks.

SECTION - C **(Marks 10 × 3=30)**

Answer any **three** questions out of five. (Answer limit 500 words) Each question carries 10 marks.

SECTION – A

1. Attempt **all** question. Answer should not exceed 50 words in each question.

   (i) Define Transpose of a Matrix with example. (2)

   (ii) Define Diagonal Matrix and Identify Matrix with example. (2)

   (iii) Define Propositions. (2)

   (iv) Define Conditional Statement. (2)

   (v) Find all the integers n such that : (2)

   $$1 < 2n - 6 < 14$$

(vi) Define Inequalities. (2)

(vii) If $A = \{1, 2, 3\}$. Find the Power Set of A. (2)

(viii) Define Cartesian Product of two Sets. (2)

(ix) Define Injective (One to One) Function. (2)

(x) Define Range and Domain of a Function. (2)

SECTION – B

2. Given :

$$\begin{pmatrix} x+y-1 & z-t+3 \\ x-y+1 & z+t-3 \end{pmatrix} = \begin{pmatrix} 2 & 4 \\ 3 & 5 \end{pmatrix}$$

Find value x, y, z, t. (4)

OR

Evaluate $A^2 - 3A + 9I$ if I is unit Matrix. (4)

$$A = \begin{bmatrix} 1 & -2 & 3 \\ 2 & 3 & -1 \\ -3 & 1 & 2 \end{bmatrix}$$

3. Prove that the statement $(P \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim P)$ is a tautology. (4)

OR

Explain Existential Quantifier and Universal Quantifier. (4)

4. Prove by Mathematical Induction (4)

$$P(n) = 1^2 + 2^2 + 3^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$$

OR

Explain greatest Common Divisor and its properties. (4)

5. Prove Associative law with properties :

(i) $(A \cup B) \cup C = A \cup (B \cup C)$ (2)

(ii) $(A \cap B) \cap C = A \cap (B \cap C)$ (2)

OR

Prove De Morgan's Laws with properties :

(i) $(A \cup B)^C = A^C \cap B^C$ (2)

(ii) $(A \cap B)^C = A^C \cup B^C$ (2)

6. Define function :

(i) Surjective (Onto) Function (2)

(ii) Bijective (One-to-One Onto) Function (2)

OR

Function $F(x) = 2x - 3$ and $g(x) = x^2 + 3x + 5$. Find Composition Function :

(i) goF (2)

(ii) Fog (2)

SECTION – C

Note : Attempt any **three** question out of five.

7. If :

$$A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

(i) Find A^{-1} (5)

(ii) Find $A . (\text{adj } A) = (\text{adj } A) . A = |A| . I$ (5)

8. Show that the following Argument is Valid.

(i) $P \rightarrow q$

$q \rightarrow r$

$\therefore \quad P \rightarrow r$ (5)

(ii) $P \vee q$

$\sim P$

$\therefore \quad q$ (5)

9. Let a = 8316 and b = 10920.

(a) Find the greatest Common divisor of a and b. (5)

(b) Find integer X and Y such that d = xa + yb

by Euclidean Algorithm. (5)

10. Explain operation of sets in detail with example. (10)

11. Explain equivalence relation with example. (10)

BC-376

BCA (Part-I) Examination, 2019

BCA-101

(Mathematics for Computer Science)

Time allowed : Three hours
Maximum Marks : 70

SECTION – A **(Marks : 2 × 10 = 20)**

Answer all **ten** questions. (Answer limit **50** words) Each question carries **02** marks.

SECTION – B **(Marks : 4 × 5 = 20)**

Answer all **five** questions. Each question has internal choice. (Answer limit **200** words) Each question carries **04** marks.

SECTION – C **(Marks 10 × 3 = 30)**

Answer any **three** questions out of five. (Answer limit **500** words) Each question carries **10** marks.

SECTION – A

1. Attempt **all** questions. Answer should not exceed **50** words in each question.

(i) Solve the equation

$$\begin{bmatrix} 1 \\ 0.6 \\ -3 \end{bmatrix} + \begin{bmatrix} -1 \\ 0 \\ 0.2 \end{bmatrix} + \begin{bmatrix} 3 \\ 1 \\ 0 \end{bmatrix}$$ 2

(ii) What is Identity Matrix ? Give an example to explain. 2

(iii) Design a truth-table for $(\sim p \vee q)$. 2

(iv) State the type of operator to be used for the following statement :
If 10 is greater than 0 then 10 is positive. Also symbolize the above statement. 2

(v) What is the product of four smallest prime numbers ? 2

(vi) State fundamental theorem of arithmetic. 2

(vii) Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
$A = \{1, 2, 3, 4\}$ and $B = \{2, 4, 6, 8\}$
(a) Find A' (b) Find B' 2

(viii) What is the finite set ? Explain with example. 2

(ix) Define symmetric relation with example. 2

(x) Check whether the following is injective. Verify your answer.

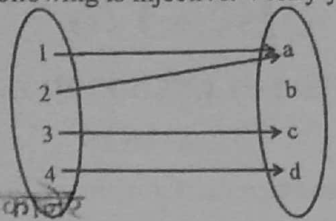

Fig. A Fig. B

SECTION – B

Find the transpose of a Matrix.

$A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & -5 & 9 \end{bmatrix}$

and verify that $(A^T)^T = A$ **4**

OR

Give $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 0 & 1 \end{bmatrix}$ and

$B = \begin{bmatrix} 3 & 1 \\ 0 & -1 \\ -2 & 3 \end{bmatrix}$

Find $C = A \times B$ **4**

Show that $(p \rightarrow q) \vee (q \rightarrow p)$ is a tantology. **4**

OR

Show that $p \rightarrow Q$ and $\sim p \vee Q$ are logically equivalent. **4**

By using Mathematical Induction prove that the given equation is true for all positive integers. **4**

$2 + 4 + 6 + \dots\dots\dots + 2n = n(n + 1)$

OR

Explain congruence relation with example. **4**

5. Given three sets P, Q and R such that

P : {x : x is a natural no. between 10 & 16}

Q : {y : y is even number between 8 & 20}

R : {7, 9, 11, 14, 18, 20}

(a) Find P – Q (b) Find Q – R

(c) Find R – P (d) Find Q – P $4 \times 1 = 4$

OR

If two sets A = {1, 2, 4, 5, 6} and B = {2, 3, 4, 8} then prove that $(A \cap B) = A' \cup B'$. **4**

6. Let A = {1, 2, 3, 4} and S = {(a, b) : a ∈ A, b ∈ A, a divides b} write S explicitly. **4**

OR

How many relations are possible from a set A of 'm' elements to another set B of 'n' elements ? Why ? List all the relations on A where A = {1, 2} **4**

SECTION – C

Note : Attempt any **three** question out of **five**.

7. Let $A = \begin{bmatrix} 1 & 3 & 2 \\ 3 & 0 & 1 \\ 1 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 7 \\ 7 \\ 5 \end{bmatrix}$

(i) Find A^{-1} $5 \times 2 = 10$

(ii) Find X if AX = B

8. What is contradiction ? Construct the truth-table for $(P \rightarrow Q) \wedge (Q \rightarrow R)$ and state whether is a contradiction. **10**

9. State steps of Euclidean Algorithm. Also write an illustration to solve it. **10**

10. If A = {1, 3, 5}, B = {3, 5, 6} and C = {1, 3, 7}

(i) Verify that $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ $5 \times 2 = 10$

(ii) Verity $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$

11. If R is the relation in N × N defined by (a, b) R (c, d) if and only if a + b = b + c, show that R is an equivalence relation. **10**

BC-196 श्री जैन (पी.जी.) कॉलेज, बीकानेर

B.C.A. (Part-I) Examination, 2020
BCA-101
(Mathematics for Computer Science)

Time allowed : Three hours

Maximum Marks : 70

SECTION – A **(Marks : 2 × 10 = 20)**

Answer all **ten** questions (Answer limit **50** words). Each question carries **2** marks.

SECTION – B **(Marks : 4 × 5 = 20)**

Answer all **five** questions. Each question has internal choice (Answer limit **200** words). Each question carries **4** marks.

SECTION – C **(Marks : 10 × 3 = 30)**

Answer any **three** questions out of **five** (Answer limit **500** words). Each question carries **10** marks.

SECTION – A

1. (i) Define complex matrix with example. 2

(ii) Define skew symmetric matrix with example. 2

(iii) Define logical equivalence. 2

(iv) What do you mean by logical implication ? 2

(v) Define absolute value with example. 2

(vi) Write down principle of Mathematical Induction. 2

(vii) Suppose U = N = {1, 2, 3, ...}, the positive integers is the Universal set. Let A = {1, 2, 3, 4}, B = {3, 4, 5, 6, 7] then find

(a) A^C

(b) A/B 2

(viii) Suppose $S = \{1, 2, 3\}$ then find Power (S).

(ix) Define Antisymmetric relation.

(x) Let $A = \{1, 2\}$, $B = \{a, b, c\}$ and $C = \{c, d\}$ then find $(A \times B) \cap (A \times C)$

SECTION – B

2. Find the Minor and Cofactor of each element of matrix $\begin{bmatrix} 1 & -3 & 2 \\ 4 & -1 & 2 \\ 3 & 5 & 2 \end{bmatrix}$. 4

OR

If $A = \begin{bmatrix} 3 & 4 \\ -2 & 0 \\ 7 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 5 & 6 \\ -1 & 8 \end{bmatrix}$ then verify that $(A + B)' = A' + B'$.

3. Show that the propositions $\neg (p \wedge q)$ and $\neg p \vee \neg q$ are logically equivalent. 4

OR

Prove that the following argument is valid $p \rightarrow \neg q, r \rightarrow q, r \vdash \neg p$.

4. Prove that $P(n) : 1^2 + 2^2 + ... + n^2 = \frac{n(n+1)(2n+1)}{6}$. 4

OR

Prove by the principal of mathematical induction

$P(n) : 1^3 + 2^3 + 3^3 + ... + n^3 = \frac{n^2(n+1)^2}{4}$.

5. Prove $(A \cup B) / (A \cap B) = (A/B) \cup (B/A)$. 4

OR

If A and B are finite sets, then $A \cup B$ and $A \cap B$ are finite now prove that

$n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

Given $A = \{1, 2\}$, $B = \{x, y, z\}$ and $C = \{3, 4\}$ then find $A \times B \times C$. 4

OR

Consider a set $A = \{a, b, c\}$ and the relation R on A defined by $R = \{(a, a), (a, b), (b, c), (c, c)\}$ find (a) reflexive (R), (b) symmetric (R) and (c) transitive (R).

SECTION – C

Find the inverse of matrix by adjoint method : 10

$$\begin{bmatrix} 1 & 2 & 5 \\ 3 & 1 & 4 \\ 1 & 1 & 2 \end{bmatrix}$$

8. (i) Write short notes on conditional and biconditional statements.

(ii) $\neg (\exists x \in A)\, p(x) \equiv (\forall x \in A) \neg p(x)$. $5 \times 2 = 10$

9. Solve the congruence equation $\log 2x \equiv 213 \pmod{2295}$. 10

10. (i) Find the power set power (A) of $A = \{1, 2, 3, 4, 5\}$.

(ii) If A and B are any two sets, then prove that $A \cup B = A \cap B \Leftrightarrow A = B$. $5 \times 2 = 10$

11. (i) Let R and S be the following relations on

$A = \{1, 2, 3\}$

$R = \{(1, 1), (1, 2), (2, 3), (3, 1), (3, 3)\}$, $S = \{(1, 2), (1, 3), (2, 1), (3, 3)\}$

Find (a) $R \cap S$, $R \cup S$, R^C (b) RoS (c) $S^2 = SoS$

(ii) Given $A = \{1, 2, 3, 4\}$ consider the following in A

$R = \{(1, 1), (2, 2), (2, 3), (3, 2), (4, 2), (4, 4)\}$

(a) Draw a directed graph.

(b) Is R (1) Reflexive (2) Symmetric (3) Transitive (4) Antisymmetric

(c) Find $R^2 = RoR$ $5 \times 2 = 10$

Roll No. : ....

Total No. of Questions : **11**]　　　　[Total No. of Printed Pages : **3**

जैन (पी.जी.) कॉलेज, बीकानेर

BC–196

BCA (Part–I) Examination, 2022

MATHEMATICS FOR COMPUTER SCIENCE

Paper - BCA-101

Time : 3 Hours]　　　　[*Maximum Marks : 70*

Section–A　　　　**(Marks : 2 × 10 = 20)**

Note :– Answer all *ten* questions (Answer limit **50** words). Each question carries **2** marks.

Section–B　　　　**(Marks : 4 × 5 = 20)**

Note :– Answer all *five* questions. Each question has internal choice (Answer limit **200** words). Each question carries **4** marks.

Section–C　　　　**(Marks : 10 × 3 = 30)**

Note :– Answer any *three* questions out of five (Answer limit **500** words). Each question carries **10** marks.

Section–A

1. (i) Define Identity Matrix.

   (ii) Define Transpose of Matrix.

   (iii) Define Propositions with example.

   (iv) Define Tautologies.

   (v) Define Greatest Common Divisor (GCD).

(vi) Define Absolute Value.

(vii) Define Power Sets with example.

(viii) Define Universal Set.

(ix) Define Relations.

(x) Define Function.

Section–B

2. If $A = \begin{bmatrix} 1 & 0 & -2 \\ 2 & 2 & 4 \\ 0 & 0 & 2 \end{bmatrix}$, verify $A^2 - 3A + 2I = 0$.

Or

Find x, y, z and w, if $3\begin{bmatrix} x & y \\ z & w \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2w \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+w & 3 \end{bmatrix}$.

3. Prove that the statement $(p \to q) \leftrightarrow (\sim q \to \sim p)$ is a tautology.

Or

Construct the Truth Tables :

$$\sim(p \vee q) \cong \sim p \wedge \sim q$$

$$p \vee (q \wedge r) \cong (p \vee q) \wedge (p \vee r)$$

4. Prove by Mathematical Induction :

$$1^2 + 2^2 + 3^2 + \ldots\ldots\ldots\ldots\ldots + (2n - 1) = n^2$$

Or

Explain Primes, divisibility and properties of Integer.

5. Explain Associative law and Commutative law.

Or

State and prove De Morgan's laws.

6. Explain :

(a) Domain and Range of a Relation

(b) Explain one to one and onto function

Or

Consider the function $f, g : R \to R$ defined by :

$$F(x) = x^2 + 3x + 1$$

$$g(x) = 2x - 3$$

Find :

(i) $f o f$

(ii) $f o g$

(iii) $g o f$

Section–C

7. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, find A^{-1}.

8. Show that given Argument is Valid :

$$p \to q$$

$$q \to r$$

$$\therefore \quad p \to r$$

9. Explain Euclidean algorithm.

10. Explain Operation on sets with example.

11. Explain Equivalence relation with example.