

This question paper contains 3 printed pages.

Roll No. 250489

B.C.A. (Part-I)

Bas. Math.

102

B.C.A. (Part-I) EXAMINATION, 2020

100424

(Faculty of Science)

(Three Year Scheme of 10+2+3 Pattern)

BASIC MATHEMATICS

Maximum Marks : 100

Time Allowed : Three Hours

Answer of all the questions (short answer as well as descriptive) are to be given in the main answer-book only. Answers of short answer type questions must be given in sequential order. Similarly all the parts of one question of descriptive part should be answered at one place in the answer-book. One complete question should not be answered at different places in the answer-book.

Write your roll number on question paper before start writing answers of questions.

Part-I : (Very short answer) consists of 10 questions of 2 marks each. Maximum limit for each question is upto 40 words.

Part-II : (Short answer) consists of 5 questions of 4 marks each. Maximum limit for each question is upto 80 words.

Part-III : (Long answer) consists of 5 questions of 12 marks each with internal choice.

PART - I

1. Attempt all the Parts.

(a) Find the range of the function $f(x) = \frac{|x-3|}{x-3}$.

(b) If $f(x) = 3x + 1$, then find $f(f(x))$.

(c) If $A = [1 \ 3 \ 4]$, then find AA^T .

(d) If $\begin{bmatrix} x-2y & 3 \\ 5 & y \end{bmatrix} = \begin{bmatrix} 7 & 3 \\ 5 & -2 \end{bmatrix}$, then find x .

(e) Write the relation between the operators Δ and E .

(f) Find the nature of the roots of the equation $x^2 - 5x + 6 = 0$.

(g) Find the arithmetic mean of the first 10 natural numbers.

(h) Write the formula for the mean deviation from mean.

(i) Find ${}^n P_{n-1}$.

(j) Three numbers are chosen from 1 to 20. Find the probability that they are consecutive.

PART - II

Attempt all the Parts.

2. (a) If $f(x) = ax + b$ and $g(x) = \frac{x-b}{a}$, for all $x \in \mathbb{R}$, where $a \neq 0$, then find $(g \circ f)(x)$ and $(f \circ g)(x)$.
- (b) If $A = \begin{bmatrix} \cos \alpha & \sin \alpha \\ -\sin \alpha & \cos \alpha \end{bmatrix}$, then verify that $A^T A = I_2$.
- (c) Find the ratio of the sum and the product of the roots of the equation $9x^2 + 6x - 8 = 0$.
- (d) Calculate the median for the following data :
- | | | | | | | | | | | |
|-------|---|---|----|----|----|----|----|----|----|----|
| x_i | : | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| f_i | : | 8 | 12 | 13 | 14 | 13 | 11 | 7 | 4 | 3 |
- (e) Find the probability that in two throws of a die, six appears in both the throws.

PART - III

Attempt all the questions by taking any two parts from each question.

3. (a) If $f: \mathbb{R} \rightarrow \mathbb{R}$ and $g: \mathbb{R} \rightarrow \mathbb{R}$ are the function defined by $f(x) = x^2 + 1$ and $g(x) = \frac{x}{x+3}$, for all $x \in \mathbb{R}$, then find $g \circ f$ and $f \circ g$, if they do exist.
- (b) If $f: \mathbb{Z} \rightarrow \mathbb{Z}$ is a function defined by $f(x) = 2x + 1$, for all $x \in \mathbb{Z}$, then define the function $g: \mathbb{Z} \rightarrow \mathbb{Z}$ such that $g \circ f \equiv I_{\mathbb{Z}}$.
- (c) If $f: \mathbb{R} \rightarrow \mathbb{R}$, where $f(x) = 2x - 3$, for all $x \in \mathbb{R}$, then prove that f is one-one and onto.

4. (a) Evaluate the determinant $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$.

(b) Find the inverse of the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$.

(c) Use Cramer's rule to solve the following system of linear equations:
 $x + 2y + 3z = 6$, $2x + 4y + z = 7$, $3x + 2y + 9z = 14$.

5. (a) Evaluate: $\left(\frac{\Delta^2}{E}\right)x^3$.

- (b) For what value of k , the sum of the roots of the equation $3x^2 + (2k+1)x - (k+5) = 0$ is equal to the product of its roots?
- (c) If α, β are the roots of the equation $x^2 - 2x + 3 = 0$, then find the equation whose roots are $\alpha + 1$ and $\beta + 1$.

6. (a) Calculate the median for the following frequency distribution :

Class	:	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80	80 - 90	90 - 100
Frequency	:	6	24	45	70	116	60	30	22	5

- (b) Calculate the mean deviation from mean for the following distribution :

Marks	:	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of Students	:	5	8	15	16	6

- (c) Find the Coefficient of Correlation for the following bivariate data :

x_i	:	1	2	3	4
y_i	:	2	4	6	8

7. (a) Tickets are numbered from 1 to 25 and are mixed up together, one ticket is drawn randomly. Find the probability that the drawn ticket has the number a multiple of 3 or 5.
- (b) Let A and B be two events, where $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{8}$. Find :
- (i) $P(A \cup B)$ and
- (ii) $P(\bar{A} \cap \bar{B})$
- (c) Two cards are drawn one by one without replacement from a well shuffled pack of 52 cards. Find the probability that both cards are king.