SH-III/BCA-304/19

BCA 3rd Semester (Honours) Examination, 2019-20

BACHELOR OF COMPUTER APPLICATION

Course ID : **Course Code : BCA-304**

Course Title : Mathematics-III

Time: 4 Hours **Full Marks : 80**

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group-A

1. Answer *all* the questions: 1×10=10

(i) The number of significant digits in $4 \cdot 560 \times 10^4$ is

(a) 2

(b) 3

(c) 4

(d) 5

(e) None of the above

(ii) The polynomial (interpolation formula) of degree three relevant to the data

x:	-1	0	1	2
$f(x)$:	1	1	1	-5

is

(a) $-x^2 - x + 1$

(b) $-x^3 - x + 1$

(c) $-x^3 + x + 1$

(d) $-x^3 - x - 1$

(e) None of the above

(iii) The coefficient of the range for the following observations:

$20, 10, 37, 15, 90, 58, 60$ is

(a) 0·6

(b) 0·7

(c) 0·8

(d) 0·9

(e) None of the above

(iv) The mean of $1, 2, 3, \ldots 2m (m \geq 2)$ is
(a) $m(m+1)/2$
(b) $2m(2m+1)/2$
(c) $(2m+1)/2$
(d) $(m+1)/2$
(e) None of the above

(v) The Newton's Raphson's method fails when
(a) $f'(x)$ is $(-)ve$
(b) $f'$is$(+)ve$
(c) $f'(x)$ is too $\log e$
(d) $f'(x)$ is zero
(e) None of the above

(vi) In the case of Bisection method, the convergence is
(a) linear
(b) quadratic
(c) very slow
(d) non-linear
(e) None of the above

(vii) The probability of 54 Sunday in a leap year is
(a) $1/7$
(b) $2/7$
(c) $3/7$
(d) $4/7$
(e) None of the above

(viii) Let $f(x)$ is given by

x:	0	$0 \cdot 5$	1
$f(x)$:	1	$0 \cdot 8$	$0 \cdot 5$

Then using Trapezoidal rule the value of $\int_0^1 f(x)dx$ is
(a) $0 \cdot 775$
(b) $0 \cdot 755$
(c) $0 \cdot 577$
(d) $0 \cdot 557$
(e) None of the above

(ix) Let A and B be two independent events with $P(A \cup B)$=$0 \cdot 58$ and $P(A \cap B) = 0 \cdot 12$, the possible value of $P(A)$ is
(a) $0 \cdot 3$
(b) $0 \cdot 4$
(c) Both (a) and (b)
(d) $0 \cdot 5$
(e) None of the above

(x) In the Newton's forward interpolation formula the value $u = \frac{x-x_0}{u}$ lies between

(a) 1 and 2

(d) -1 and 1

(c) -1 and -2

(d) 0 and α

(e) None of the above

Group-B

2. Answer *any ten* questions: 2×10=20

(i) What do you mean by 'statistical regularity'?

(ii) What is probability density function?

(iii) Define 'Random variable' and 'Random experiment'.

(iv) Define 'Inherrent Error' with example.

(v) What is 'Histogram'?

(vi) Define 'Absolute Error' and 'Relative Error'.

(vii) Compute the percentage error in the time period $T = 2\pi\sqrt{l/q}$ for $l = 1m$ if the error in the measurement of l is $0 \cdot 01$.

(viii) Prove that the second order forward difference are zero for the function $f(x) = 2x + 5$.

(ix) State geometrical significance of Trapezoidal Rule.

(x) What do you mean by likelihood function?

(xi) Show that probability of complementary events $\bar{A}$ of the even A is given by $P(\bar{A}) = 1 - P(A)$.

(xii) Write geometrical representation of Newton-Raphson method.

(xiii) Define Regula Falsi method to find the root of an equation.

(xiv) Show that $P(AB) \geq P(A) + P(B) - 1$.

(xv) What do you mean by 'confidence intervals'?

Group-C

3. Answer *any four* questions: 5×4=20

(i) Write a program to implement Simpson's Rule to evaluate to integral $\int_0^1 \frac{dx}{x^2-2x+3}$ using sub-intervals. 5

(ii) When two events are independent? If two events A and B are independent show that A and $\bar{B}$ are independent and hence show that $\bar{A}$ and $\bar{B}$ are independent.

(iii) Determine the value of the constant K $s.t$ $f(x)$ is defined by

$f(x) = Kx(1-x), 0 < x < 1$

$= 0$, elsewhere

is a probability density function and find the corresponding distribution function and $P(X \geq \frac{1}{3})$.

(iv) A and B are two events associated with the some experiment E and $P(A+B)=7/8$, $P(AB)=1/4$ and $P(\bar{A})=5/8$. Find $P(A), P(B)$ and $P(A\bar{B})$ and find out whether the events A and B are independent to each other.

(v) Given that $\frac{dy}{dx}=x^2+y^2, y(0)=0$, compute $y(0\cdot 15)$ by Euler method correct up to four decimal places taken up step length $h=0\cdot 05$.

(vi) Using the Newton's forward interpolation formula from the following table:

Years	1998	2000	2002	2004	2006
Sales (Rs.)	40	43	48	52	57

Group-D

4. Answer *any three* questions: 10×3=30

(i) Find $f(102)$ from the following table:

x:	93·0	96·2	100·0	104·2	108·7
$y=f(x)$:	11·38	12·80	14·70	17·07	19·91

(ii) Deduce Fourth order Runga-Kutta method and give advantage and disadvantage of this method.

(iii) Solve by Gauss-Elimination method.

$3x+9y-2Z=11, 4x+2y+13Z=24, 4x-2y+Z=-8$

(iv) Define correlation coefficient between two random variables. If $a(\neq 0), c(\neq 0), b, d$ are constant, then show that $\rho\,(aX+b, cy+d)=\frac{ac}{|a||c|}\rho(X,Y)$ and also show that $-1\leq\rho(X,Y)\leq 1$.

(v) Using Newton-Raphson method, find a real root to the equation $x^4-x-10=0$ which is nearer to $x=2$ correct up to three place of decimals.

(vi) Calculate the arithmetic mean, median and mode for the following frequency distribution:

Height:	56–60	61 – 65	66 – 70	71 – 75	76 – 80
No. of Persons:	7	25	43	28	7

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