NEW

2018

BCA

2nd Semester Examination

MATHEMATICAL FOUNDATION FOR COMPUTER SCIENCE

PAPER—1203

Full Marks : 100

Time : 3 Hours

The figures in right-hand the margin indicate full marks.

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

Illustrate the answers wherever necessary.

Answer Q. No. *1* and any *six* from the rest, taking at least *one* from each group.

1. Answer any *five* questions. 5×2

(a) Show that the set of vectors

$\{(1, 7, -4), (1, -3, 2), (2, -1, 1)\}$ is linearly dependent.

(b) Investigate the nature of the roots of the equation

$x^4 - 6x^2 - 8x - 3 = 0$ by Descarte's rule of sign.

(c) If the sum of two roots of the equation

$x^3 + px^2 + qx + r = 0$ is zero, then show that $pq = r$.

(d) State Rolle's theorem.

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

(f) If the events A and B are independent then A^c and B^c are independent.

(g) Find the geometrical interpritation of $\frac{dy}{dx}$.

(h) Define normal distribution.

Group–A

(Algebra)

2. (a) If α be a multiple root of order 3 of the equation

$x^4 + bx^2 + cx + d = 0$, then show that $\alpha = -\frac{8d}{3c}$. 5

(b) Use Cayley–Hamilton theorem to compute A^{-1}

Where $A = \begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$. 5

3. (a) Solve by Cardan's method $x^3 - 6x - 9 = 0$. 5

(b) Show that the roots of the equation

$$\frac{1}{x-a} + \frac{1}{x-b} + \frac{1}{x-c} - \frac{1}{x} = 0$$

Where $a > b > c > 0$ are all real. 5

4. (a) Show that $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$ 5

(b) Solve the equations by matrix method

$2x + 3y + z = 11$, $x + y + z = 6$, $5x - y + 10z = 34$.

5

Group–B

(Calculus)

5. (a) If $y = \tan^{-1}x$ then prove that

$$(1 + x^2)y_{n+2} + 2(n + 1)xy_{n+1} + n(n + 1)y_n = 0.$$ 5

(b) Evaluate $\int \frac{dx}{x\sqrt{1-x^3}}$. 5

6. (a) State Euler's theorem on homogenous function and verify it for the function $u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right)$. 5

(b) Prove that $0 < \frac{1}{x}\log\left(\frac{e^x - 1}{x}\right) < 1$ using M.V.T. 5

7. (a) Express $\int_a^b e^{-x}dx$ as the limit of a sum and hence evaluate it. 5

(b) Evaluate $\int_0^{\pi/2} \frac{dx}{3+5\cos x}$. 5.

Group–C

(Probabilities)

8. (a) State classical definition of probability. Deduce that

(i) $0 \le P(A) \le 1$,

(ii) $P(S) = 1$ where A is any arbitrary event in the event spaces. 2+3

(b) If A, B are any events, prove that

Prob $(A + B)$ = Prob (A) + Prob (B) – Prob (AB). 5

9. (a) A box contains 12 blue and 9 red pens. It 5 pens are randomly taken from the box, find the probability that (a) no red pen is taken. (b) at least 3 blue pens are taken. 5

(b) Find the value of the constant c such that

$f(x) = cx(1 - x) = 0, \quad 0 < x \le 1$ elsewhere.

is a possible probability density function and compute

$P\left(x > \frac{1}{2}\right)$. 5

10. (a) If the lines of regression of y on x and x an y are $3x + 2y = 26$ and $6x + y = 31$ respectively. Find the correlation coefficient between x and y. 5

(b) Define Binomial distribution and calculate its mean. 5

[Internal Assessment—30 Marks]

———