

**B.Tech. - VIEP - Computer Science & Engg.
(BTCSVI) / B.Tech. Electronics and
Communication Engg. (BTECVI) / B.Tech.
Electrical Engg. (BTELVI)**

00319 Term-End Examination

December, 2017

BICE-007 : MATHEMATICS-III

Time : 3 hours

Maximum Marks : 70

Note : All questions are compulsory. Use of scientific calculator is permitted.

1. Answer any *two* of the following : 2×7=14

(a) If $u = e^x (x \cos y - y \sin y)$ is a harmonic function, find an analytic function $f(z) = u + iv$ such that $f(1) = e$.

(b) Expand $\frac{1}{z^2 - 3z + 2}$ in the region

(i) $|z| < 1$

(ii) $1 < |z| < 2$

(iii) $|z| > 2$

- (c) Evaluate the following integral using Cauchy's Integral formula :

$$\int_C \frac{4 - 3z}{z(z-1)(z-2)} dz, \text{ where } C \text{ is the circle}$$

$$|z| = 3/2.$$

2. Answer any *two* of the following : 2×7=14

- (a) Obtain the moment generating function of the random variable x having probability distribution

$$f(x) = \begin{cases} x, & \text{for } 0 < x < 1 \\ 2 - x, & \text{for } 1 \leq x < 2 \\ 0, & \text{elsewhere} \end{cases}$$

Also determine mean and variance.

- (b) Given the following experimental values :

| | | | | |
|---|---|---|----|----|
| x | 0 | 1 | 2 | 3 |
| y | 2 | 4 | 10 | 15 |

Fit by the method of least squares, a parabola of the type $y = a + bx^2$.

- (c) The lifetime of electric bulbs for a random sample of 10 from a large consignment gave the following data :

| Item | Life in '000 Hours |
|------|--------------------|
| 1 | 4.2 |
| 2 | 4.6 |
| 3 | 3.9 |
| 4 | 4.1 |
| 5 | 5.2 |
| 6 | 3.8 |
| 7 | 3.9 |
| 8 | 4.3 |
| 9 | 4.4 |
| 10 | 5.6 |

Can we accept the hypothesis that the average lifetime of a bulb is 4000 hours ?

3. Answer any *two* of the following : $2 \times 7 = 14$

- (a) A manufacturer knows that the condensers he makes contain on an average 1% of defectives. He packs them in boxes of 100. What is the probability that a box picked at random will contain 4 or more faulty condensers ?

- (b) A set of five similar coins is tossed 320 times and the result is as follows :

| No. of Heads | 0 | 1 | 2 | 3 | 4 | 5 |
|--------------|---|----|----|-----|----|----|
| Frequency | 6 | 27 | 72 | 112 | 71 | 32 |

Test the hypothesis that the data follows a binomial distribution. It is given that for $v = 5$, $\chi^2_{0.05} = 11.07$.

- (c) The following is the data of 10 samples of size 100 each. Construct NP-chart and give your comments.

| Sample No. | No. of Defectives |
|------------|-------------------|
| 1 | 6 |
| 2 | 9 |
| 3 | 12 |
| 4 | 5 |
| 5 | 7 |
| 6 | 8 |
| 7 | 8 |
| 8 | 16 |
| 9 | 13 |
| 10 | 7 |

4. Answer any *two* of the following :

2×7=14

- (a) Find a positive real root of $x^3 - 4x + 1 = 0$ by the method of false position.
- (b) Using Newton's forward interpolation formula, find the cubic polynomial and hence evaluate $f(0.5)$ by the following data :

| | | | | | |
|------|----|---|----|----|-----|
| x | 0 | 1 | 2 | 3 | 4 |
| f(x) | -1 | 0 | 13 | 50 | 123 |

- (c) Given the data $f(1) = 4$, $f(2) = 5$, $f(7) = 5$, $f(8) = 4$. Compute $f(6)$ using Lagrange's interpolation formula.

5. Answer any *two* of the following :

2×7=14

- (a) Solve the following system by Gauss-Seidel method, correct to two places of decimal :

$$10x + 2y + z = 9$$

$$2x + 20y - 2z = -44$$

$$-2x + 3y + 10z = 22$$

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using

(i) Simpson's 1/3rd rule,

(ii) Simpson's 3/8th rule.

(c) Using Runge-Kutta method of fourth order,

solve $\frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2}$ with $y(0) = 1$ at $x = 0.2$

and $h = 0.1$.
