

FACULTY OF ENGINEERING

B.E. 2/4 (ECE/M/P/ AE/CSE) II – Semester (Main) Examination, June 2014

Subject : Mathematics – IV

Time : 3 hours

Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.**PART – A (25 Marks)**

- 1 Evaluate $\int_c \frac{2z+1}{(z+1)(z-1)(z+2)} dz$, where c is $|z| = \frac{3}{2}$ by using residue theorem. (3)
- 2 Evaluate $\int_0^{1+i} (x^2 + iy) dz$ along $y = x$. (2)
- 3 Find the zeros of $f(z) = e^z - 1$. (3)
- 4 Determine the points at which the mapping $w = \sin \pi z$ is not conformal. (3)
- 5 A, B are two mutually exclusive events of a random experiment. If $P(A \cup B) = 0.75$ and $P(\bar{A}) = 0.6$ then find $P(B)$. (3)
- 6 Find the expectation of Gamma variate with one parameter. (2)
- 7 A continuous random variable x has the pdf (3)
- $$f(x) = \begin{cases} a + bx & 0 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$
- If the mean of the distribution is $\frac{1}{3}$, find the values of a, b .
- 8 Write 4 properties of normal distribution. (2)
- 9 Write the normal equations of the curve $y = a + bx + cx^2$. (3)
- 10 Two random variables have the regression lines with equations $3x + 2y = 26$ and $6x + y = 31$. Find the mean values and the correlation coefficient between x and y . (2)

PART – B (50 Marks)

- 11 a) Show that $J \begin{pmatrix} u, v \\ x, y \end{pmatrix} = |f'(z)|^2$ where $f(z) = u(x, y) + iv(x, y)$, and J is the Jacobian. (5)
- b) State and prove Cauchy's integral formula. (5)
- 12 a) Evaluate $\int_{-\infty}^{\infty} \frac{dx}{(x^2 + a^2)^2}$. (5)
- b) Expand $\frac{7z-2}{(z+1)z(z-2)}$ in the region $1 < |z+1| < 3$ (5)

- 13 a) State and prove Baye's theorem. (5)
 b) If X is a random variable with probability distribution function (5)

x	0	1	2	3	4	5	6
P(x)	0.15	0.1	0.05	0.3	0.2	0.1	0

find $E(x + 1)$, $E(3x + 2)$, $V(3x + 4)$.

- 14 a) Derive the MGF of normal distribution. (5)
 b) Two random samples of sizes 9 & 6 are given the following values of the variate. (5)

Sample-I	15	22	28	26	18	17	29	21	24
Sample-II	8	12	9	16	15	10	-	-	-

Test the difference of estimates of the population variances at 5% level of significance. [$F_{0.05}$ at (8, 5) df = 3.69].

- 15 Find the correlation coefficient between x & y for the following values and also the regression lines. (10)

x	1	2	3	4	5	6	7	8	9	10
y	10	12	16	28	25	36	41	49	40	50

- 16 a) Prove that $u = x^2 - y^2$, $v = \frac{y}{x^2 + y^2}$ are harmonic. (5)
 b) Find the bilinear transformation which maps the points $z = -1, i, 1$ into $w = 1, -i, -1$. (5)
- 17 a) Fit a Poisson distribution to the following data. (5)

x	0	1	2	3	4
f(x)	46	38	22	9	1

- b) Evaluate $\int_0^{2\pi} \frac{d\theta}{2 + \sin \theta}$. (5)
