Code No. : 6121

FACULTY OF ENGINEERING

B.E. 2/4 (ECE/EEE/P/CSE) II Semester (Main) Examination, June 2010

MATHEMATICS – IV

Time: 3 Hours] [Max. Marks: 75

Instructions : *Answer* ***all*** *questions of Part* ***A.***
Answer ***five*** *questions from Part* ***B.***

PART – A **(25 Marks)**

1. Choose the correct answers from the following the value of $\int_C \frac{e^{-2z}}{(z+1)^3} dz$ where C is the circle $|z| = 2$. 2

   a) $-2\pi i$ b) $2\pi i$ c) $4\pi i$ d) None

2. Write the Cauchy-Riemann equations in polar form. 2

3. Find the image of the curve (the circle) $|z-3| = 5$ under the mapping $w = \frac{1}{z}$. 2

4. Expand the function log (1 + z) as a Taylor's series about z = 0. 3

5. A random variable x has the probability density function
   $f(x) = 6x(1-x) \quad 0 \le x \le 1$.

   Find mean, median and mode. 2

6. Indicate whether the following statement are true or false.

   a) If $f(z) = e^{1/z}$; the singularity at z = 0 is called removable singularity. 1

   b) $E(ax + b) = a^2E(x) + b$ 1

   c) Arithmetic mean of regression coefficients is greater than the correlation coefficient. 1

7. Write down conditions for applying χ^2 test. 2

8. The first four moments of x about x = 5 are 1, –5, 15 and 30. Find the corresponding four moments about the mean. 3

9. The normal distribution is a limiting form of binomial distribution if

   a) $n \to \infty, p \to 0,$

   b) $n \to 0, p \to q,$

   c) $n \to \infty, p \to n$

   d) $n \to \infty$ and neither p nor q is small. **3**

10. A sample of 20 items has mean 42 units and S.D. 5 units. Test the hypothesis that it is a random sample from a normal population with mean 45 units. **3**

PART – B **(50 Marks)**

11. a) Determine the analytic function whose real part is e^{2x} (x cos 2y – y sin 2y).

    b) If f(z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$.

12. a) If f(z) is analytic and $f'(z) \neq 0$ in the region R of the z-plane, then show that the mapping w= f(z) is conformal at all the points of R.

    b) State and prove Cauchy's integral theorem.

13. State the residue theorem, and evaluate

    i) $\oint_C \frac{z-3}{z^2+2z+5}\,dz$, where C is the circle $|z|=1$

    ii) $\oint_C \frac{z}{(z-1)(z-2)^2}\,dz$, where C is the circle $|z-2|=\frac{1}{2}$.

14. a) A coin is tossed until a head appears. What is the expectation of the number of tosses required ?

    b) Two unbiased dice are thrown. Find the expected values of the sum of number of points on them.

15. a) Fit a Poisson distribution to the following :

x :	0	1	2	3	4
f :	192	100	24	3	1

b) Find the m.g.f. and mean for Chi-square function.

16. Obtain the coefficient of correlation for the following data :

X	68	64	75	50	64	80	75	40	55	64
Y	62	58	68	45	81	60	68	48	50	70

17 a) Two random variables have the regression lines $3x + 2y = 26$ and $6x + y = 31$. Find the mean value and the correlation coefficient between x and y.

b) Two random samples drawn from two normal population have the variable values as below.

Sample I	19	17	16	28	22	23	19	24	26			
Sample II	28	32	40	37	30	35	40	28	41	45	30	36

Obtain the estimate of the variance of the population and test whether the two population have the same variance.

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