

**FACULTY OF ENGINEERING**  
**B.E. II/IV Year (ECE/Mech./Prod./CSE) II Semester (Main)**  
**Examination, April/May 2008**  
**(New)**

**MATHEMATICS – IV**

Time : 3 Hours]

[Max. Marks : 75

*Answer all questions of Part A.*  
*Answer any five questions from Part B.*

**Part A – (Marks : 25)**

Choose the correct answer from the following :

1. If  $f(z)$  is analytic in a domain  $D$  and  $|f(z)| = K$  (constant) in  $D$  then  $f(z)$  is \_\_\_\_\_ in  $D$ .  
(a) Constant                      (b) 0                      (c) None
2. The value of  $\int_0^{1+i} (x - y + i x^2) dz$  along the line from  $z = 0$  to  $z = 1 + i$  is :  
(a)  $\frac{1-i}{3}$                       (b)  $\frac{i-1}{3}$                       (c)  $\frac{-1-i}{3}$                       (d) None
3. Using Cauchy's Integral formula the value of  $\int_C \frac{zdz}{z^2+1}$  where  $C : |z+i| = 1$  is  
(a)  $-\pi i$                       (b)  $2\pi i$                       (c)  $\pi i$                       (d) None
4. Residue of  $f(z) = \frac{z \sin z}{(z-\pi)^3}$  at  $z = \pi$  is  
(a) 1                      (b) 0                      (c) -1                      (d) None
5. Using Residue theorem the value of  $\int_C \frac{z-2}{z^2-z} dz$  where  $C$  is the circle  $|z| = 2$  is \_\_\_\_\_.  
(a)  $\pi i$                       (b)  $-\pi i$                       (c)  $2\pi i$                       (d) None
6. If  $A$  and  $B$  are two independent events,  $P(A/B^c)$  is \_\_\_\_\_.  
(a)  $P(A)$                       (b)  $P(B^c)$                       (c)  $P(A) \cdot P(B^c)$                       (d)  $P(A^c/B)$

7. The test statistics for equality of population variances is ———.

$$(a) Z = s_1^2 - s_2^2 / \sqrt{\frac{\sqrt{x^2}}{x_1} + \frac{\sqrt{y^2}}{x_2}}$$

$$(b) F = \frac{s_1^2}{s_2^2} (s_1^2 > s_2^2)$$

$$(c) F = \frac{s_1^2}{s_2^2} (s_1^2 < s_2^2)$$

$$(d) Z = \frac{\bar{x} - \mu}{\pi / \sigma x}$$

8. If  $A$  and  $B$  are two mutually exclusive events then  $P(A \cap B) = P(A) \cdot P(B/A)$

(TRUE / FALSE)

9. If the number of observations ( $n < 30$ ) then the test known as large sample test.

(TRUE / FALSE)

10. A random sample of 10 boys had the IQ's 70, 120, 110, 101, 88, 83, 95, 98, 107 and 100. Do these data support the assumption of a population mean IQ of 160.

**Part B** – (Marks :  $5 \times 10 = 50$ )

11. (a) Verify that the function  $V(x, y) = e^{-x}(y \sin y + x \cos y)$  is harmonic and find the corresponding analytic function  $f(z) = u(x, y) + iV(x, y)$ .

(b) Find the bilinear transformation that maps  $z = 1, i, -1$  onto  $w = 2, i, -2$ .

12. (a) Evaluate  $\int_C \frac{dz}{z^2 + 9}$  where  $C$  is  $|z - 3i| = 4$  using Cauchy's integral formula.

(b) Evaluate  $\int_{-\infty}^{\infty} \frac{x \sin(mx) dx}{x^2 + a^2}$   $m > 0, a > 0$  using residue theorem.

13. (a)  $X$  is a normal variate with mean 30 and standard deviation is 5. Find the probabilities that (i)  $26 \leq x \leq 40$ , (ii)  $x \geq 45$ .

(b) Fit a Poisson distribution to the following data :

No. of mistakes per page	:	0	1	2	3	4
No. of pages	:	109	65	22	3	1

14. (a) Fit a second degree parabola by using least squares approximation for the following data :

$x$	:	1	2	3	4
$y$	:	1.7	1.8	2.3	3.2

- (b) Derive  $r$  lies between  $-1$  to  $1$ .

15. (a) State and prove Baye's theorem.

- (b) The diameter of an electric cable say  $X$  is assumed to be continuous Random variable with probability density function is given by  $f(x) = 6x(1 - x)$ ;  $0 \leq x \leq 1$ . Determine a number  $b$  such that  $P(x < b) = P(x > b)$ .

16. (a) Expand  $f(z) = \frac{2z - 3}{z^2 - 3z + 2}$  in the region  $1 < |z| < 2$ .

- (b) Find the correlation coefficient and equations of regression lines for the following values of  $x, y$ .

$x$	:	1	2	3	4	5
$y$	:	2	5	3	8	7

17. (a) State and prove Cauchy's integral theorem.

- (b) If 2% of the items made by a factory are defective. Find the probability  $p$  that there are defective items in a sample of 100 items.