

(Please write your Exam Roll No.)

END TERM EXAMINATION

SECOND SEMESTER [B.TECH.] - MAY-JUNE 2009

Paper Code: ETMA-102

Subject: Applied Mathematics-II

Paper ID: 99102

(Batch: 2001-2003)

Time : 3 Hours

Maximum Marks :75

Note: Attempt any five questions including Q.No.1 which is compulsory.

- Q.1 (a) If the system of equations $x + ay + az = 0$, $bx + y + bz = 0$, $cx + cy + z = 0$, where a, b, c are non zero and non unity, has a non-trivial solution, then show that $\frac{a}{1-a} + \frac{b}{1-b} + \frac{c}{1-c} = 1$. (2)
- (b) Let T be a transformation from R^3 in to R^1 defined by $T(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2$. Show that T is not a linear transformation. (2)
- (c) Let a 3×3 matrix A have eigenvalues $1, 2, -1$. Find the trace of the matrix $B = A - A^{-1} + A^2$. (2)
- (d) If a is a constant vector and $r = xi + yj + zk$. Show that $\text{curl}(ar) = 2a$. (2)
- (e) Evaluate $\int_C (x^2 + iy^3) dz$, C : the straight line path from $z = 1$ to $z = 1 + 2i$. (2)
- (f) A continuous random variable X has the p.d.f. $f(x) = a + bx$, $0 \leq x \leq 1$ (2)

0 , e.w. If the mean of the distribution is $\frac{1}{3}$. Find the

values of a & b .

- (g) The random variable X is normally distributed with mean equal to 9 and standard deviation 3 . Find the probability. (i) $x \geq 15$ (ii) $x < 15$ (iii) $0 \leq x \leq 9$ (3)

- Q.2 (a) Find the analytic function $f(z)$ such that $\text{Re}[f(z)] = 3x^2 - 4y - 3y^2$ and $f(1+i) = 0$. (7.5)
- (b) Evaluate the line integral using the Green's theorem $\int_C (x^2 + y^2) dx + (5x^2 - 3y) dy$ C : is the boundary of the region enclosing $x^2 = 4y$ & $y = 4$. (7.5)

- Q.3 (a) The number of students in a class is 100 . The average marks scored by 64 boys is 66 with standard deviation of 10 , while the average marks scored by 36 girls is 70 with standard deviation of 8 . Test at 1% level of significance whether the girls performed better than boys. (7.5)
- (b) Find the value of θ for which the system of equations $2(\sin\theta)x + y - 2z = 0$, $3x + 2(\cos 2\theta)y + 3z = 0$, $5x + 3y - z = 0$, has a nontrivial solution. (7.5)

- Q.4 (a) Find all possible Taylor's and Laurent's series expansions for the function $f(z) = \frac{1}{(a-z)(b-z)}$, $(a) < (b)$, about the point $z_0 = 0$. (7.5)
- (b) Find the value of C such that $f(x, y) = cxy$, $1 \leq x \leq y \leq 2$ is a probability density function. (7.5)

Q.5 (a) Evaluate the integral $I = \oint_C \frac{dz}{Z^4 + 1}$, $C: |Z-1| = 1$. (7.5)

(b) Diagonalise the matrix (7.5)

$$\begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$$

Q.6 (a) Find the bilinear transformation such that the points 1, i are its fixed points and the point 0 is mapped as -1. (7.5)

(b) Evaluate the surface integral $\iint_S F \cdot n \, dA$, where $F = 6Zi + 6j + 3yk$, and S is the portion of the plane $2x + 3y + 4z = 12$, which is in the first octant. (7.5)

Q.7 (a) Evaluate $\int_0^{2\pi} \frac{d\theta}{2 + \sin \theta}$ by using the complex integration. (7.5)

(b) Two candidates A and B contested for an election for the post of college student's union president. The college has large number of students from the urban and rural areas. A sample of 500 students was drawn to find the preferences of the students. The following data was obtained. (7.5)

Area	Votes for	
	A	B
Urban	120	80
Rural	125	175

Determine whether the nature of the area is related to the voting preferences of the students.
