

TMA-310**B. TECH. (ECE) (THIRD SEMESTER)
END SEMESTER EXAMINATION, 2018
ADVANCED ENGINEERING MATHEMATICS****Time : Three Hours****Maximum Marks : 100**

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Each part carries ten marks. Total marks assigned to each question are twenty.

1. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find the Fourier transform of the function :

$$f(x) = \begin{cases} 1 + \frac{x}{a}, & -a < x < 0 \\ 1 - \frac{x}{a}, & 0 < x < a \\ 0, & \text{otherwise} \end{cases}$$

(2)

TMA-310

(b) Solve $\frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial x^2}$ for $0 \leq x < \infty$, $t > 0$

given the conditions :

(i) $u(x, 0) = 0$ for $x \geq 0$

(ii) $\frac{\partial u}{\partial x}(0, t) = -a$ (constant)

(iii) $u(x, t)$ is bounded

(c) Find the Z-transform of $\cosh\left(\frac{k\pi}{2} + \alpha\right)$.

2. Attempt any two questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find the values of C_1 and C_2 such that the function :

$$f(z) = x^2 + C_1 y^2 - 2xy + i(C_2 x^2 - y^2 + 2xy)$$

is analytic. Also find $f'(z)$.

(b) Evaluate the line integral $\int z^2 dz$ along the boundary of a triangle with vertices 0, $1 + i$, $-1 + i$ clockwise.

(c) Use Cauchy integral formula to evaluate :

$$\oint \frac{\sin(\pi z^2) + \cos(\pi z^2)}{(z-1)(z-2)} dz, \text{ along } |z| = 3.$$

(3)

TMA-310

3. Attempt any two questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Find the first three terms of the Taylor series expansion of $f(z) = \frac{1}{z^2 + 4}$ about $z = -i$. Also find the region of convergence.

(b) Using contour integration to evaluate the value of the integral $\int_0^{2\pi} \frac{d\theta}{2 + \cos \theta}$.

(c) Find a bilinear transformation which maps the points $i, -i, 1$ of the z -plane into 0, 1, ∞ of the w -plane respectively.

4. Attempt any two questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Calculate the variance and third central moment from the following data :

x_i	f_i
0	1
1	9
2	26
3	59
4	72
5	52
6	29
7	7
8	1

(4)

TMA-310

- (b) The ages of the husbands and wives are given in the following table :

Age of Husband	Age of Wife
x	y
23	18
27	22
28	23
29	24
30	25

Calculate the coefficient of correlation between x and y from the above table.

- (c) Assuming half the population of a town consumes chocolates and that 100 investigators each take 10 individuals to see whether they are consumers, how many investigators would you expect to report that three people or less were consumers?

5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

- (a) Find the least squares fit of the form $y = a + bx^2$ to the following data :

x	y
-1	2
0	5
1	3
2	0

F No. c-50

(5)

TMA-310

- (b) Fit a parabolic curve of regression of y on x to the following data :

x	y
1.0	1.1
1.5	1.3
2.0	1.6
2.5	2.0
3.0	2.7
3.5	3.4
4.0	4.1

- (c) Use Cardan's method to solve :

$$x^3 - 27x + 54 = 0$$

TMA-310

50

F No. c-50