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TMA–310

B. Tech. (ECE) (Third Semester)
End Semester EXAMINATION, 2017
ADVANCE ENGINEERING MATHEMATICS

Time : Three Hours] [*Maximum Marks : 100*

Note : (i) This question paper contains *five* questions.

(ii) All questions are compulsory.

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

(iv) 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 cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$.

(b) Find the inverse Z-transform of :

$$\frac{2z^2+3z}{(z+2)(z-4)}$$

(c) Use Fourier sine transformation to solve the equation $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$ under the conditions :

(i) $u(0, t) = 0$

(ii) $u(x, 0) = e^{-x}$

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

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

(a) Show that the function $f(z)$ is defined by :

$$f(z) = \begin{cases} e^{-z^{-4}}, & z \neq 0 \\ 0, & z = 0 \end{cases}$$

is not analytic at the origin even though it satisfies Cauchy-Riemann equation at the origin.

(b) Prove that $u = x^4 + y^4 - 6x^2y^2$ is harmonic. Also find analytic function $f(z) = u + iv$ in terms of z.

(c) Evaluate the integral :

$$\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$$

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

(a) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for $1 < |z| < 3$.

(b) Find the residue of a function $f(z) = \frac{z^2}{(z+1)^2(z-2)}$ at its double pole.

(c) Show that the relation $w = \frac{5-4z}{4z-2}$ transforms the circle $|z| = 1$ into a circle of radius unity in the w-plane and find the centre of this circle.

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

(a) In a bolt factory, machines A, B and C manufacture respectively 25%, 35%, 40% of the total of their output 5%, 4%, 2% are defective bolts. A bolt is drawn at from the product and is found to be defective. What are the probability that is was manufactured by machines A, B and C ?

(b) Let X is a normal variate with mean 30 and S.D. 5, find the probabilities that :

(i) $26 \leq X \leq 40$

(ii) $X \geq 45$

(c) Define Moment Generating Function (MGF) and find the MGF of discrete Poisson distribution.

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

(a) Fit a straight line to the following data by least square method :

x	y
0	1
1	1.8
2	3.3
3	4.5
4	6.3

(b) Obtain the line of regression of y on x from the following data :

x	y
1.53	33.50
1.78	36.30
2.60	40.00
2.95	45.80
3.42	53.50

(c) Solve the equation $x^4 - 6x^3 - 3x^2 + 22x - 6 = 0$ by Descartes' method.