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TMA–302

B. Tech. (CE) (Third Semester)

End Semester EXAMINATION, 2017

ENGINEERING MATHEMATICS—III

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 $\dfrac{1}{1+x^2}$ and hence find Fourier sine transform of $\dfrac{x}{1+x^2}$.

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(b) Find the Fourier transform of the function $xe^{-a|x|}$.

(c) Use Fourier sine transformation to solve the equation $\dfrac{\partial u}{\partial t} = 2\dfrac{\partial^2 u}{\partial x^2}$ 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 $f(z)$ 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) Show that the relation $w = \dfrac{5-4z}{4z-2}$ transform the circle $|z| = 1$ into a circle a radius unity in the w-plane and find the centre of this circle.

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

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

(a) Evaluate $\sqrt{12}$ to four decimal places by Newton-Raphson's method.

(b) Using iterative method, find a root of the equation $2x - \cos\theta - 3 = 0$.

(c) Compute the value of π from the formula $\dfrac{\pi}{4} = \int_0^1 \dfrac{dx}{1+x^2}$ by using Trapezoidal rule, taking $h = 1/4$.

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 $x^3 + x^2 - 16x + 20$ by Cardan's method.