FACULTY OF ENGINEERING

B.E. 2/4 I - Semester (Main) Examination, December/January 2014-15

Subject : Mathematics – III
(Common to All Except. I.T.)

Time : 3 Hours   Max. Marks: 75

Note: Answer all questions of Part - A and answer any five questions from Part - B.

PART – A (25 Marks)

1 Form the partial differential equation from $z = f\left(\dfrac{xy}{z}\right)$ by eliminating the arbitrary. function f. (2)

2 Solve p + q = pq. (2)

3 Find 'a_0' in the Fourier series expansion of f(x) = |sin x| in [-π, π]. (2)

4 Write Dirichlet's conditions. (2)

5 Solve $3u_x + 2u_y = 0$ u(x,0)=$4e^{-x}$. (2)

6 Show that u = sinx sinhy is a solution of Laplace equation. (3)

7 Write Newtons forward and backward interpolation formulae for equal intervals. (3)

8 Explain bisection method to find a root of f(x)=0. (3)

9 State the initial value theorem of Z-transforms. (3)

10 Show that $Z\{1\} = \dfrac{z}{z-1}$. (3)

PART – B (50 Marks)

11 (a) Find the complete integral of $(p^2 + q^2)x = pz$ by Charpit's method. (5)
    (b) Solve $x^2(y - z)p + y^2(z – x)q = z^2(x – y)$. (5)

12 (a) Find the Fourier series for f(x)=e^x in [0, 2π]. (5)
    (b) Find the Half range Fourier cosine series of f(x)=x in 0 < x< 2. (5)

13 An insulated rod of length ℓ has its ends A & B maintained at 0^oC & 100^oC respectively until steady state condition prevails. If B is suddenly reduced to 0^oC and maintained at 0^oC, find the temperature at a distance x from A at time t. (10)

14 (a) Use Runge-Kutta 4th order method to find y when x = 1.2 in steps of 0.1 given that
$\dfrac{dy}{dx} = x^2 + y^2$ and y(1)=1.5. (5)

    (b) Find the value of y at x = 7 from the following data. (5)

x	5	6	9	11
y	12	13	14	16

15 (a) Show that $Z[\sin n\theta] = \dfrac{z\sin\theta}{z^2 - 2z\cos\theta + 1}$. (5)

    (b) Solve $y_{n+2} - 3y_{n+1} + 2y_n = 0$, y_0 = -1, y_1= 2 using Z-transforms. (5)

16 (a) Find $Z^{-1}\left[\dfrac{z^2}{(z-1)^2}\right]$ by using Convolution theorem. (5)

    (b) Find a real root of the equation $x^2 – 4x – 9 = 0$ using Newton Raphson method. (5)

17 (a) Solve $\dfrac{\partial u}{\partial t} = C^2\dfrac{\partial^2 u}{\partial x^2}$ by method of separation of variables. (5)

    (b) Find the half range Fourier sine series for $f(x) = \begin{cases} x, & 0 < x < \pi/2 \\ 0, & \pi/2 < x < \pi \end{cases}$ (5)

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