FACULTY OF ENGINEERING
B.E. 2/4 (CE/EE/Int/ECE/M/P/AE/CSE) I – Semester (Main.) Examination, December 2013
Subject: Mathematics – III

Time: 3 Hours Max.Marks : 75

Note: Answer all questions from Part – A. Answer any five questions from Part – B.

PART – A (25 Marks)

1. Form a partial differential equation by eliminating the arbitrary function f from
   \( z = e^{ax+by} f(ax-by) \). 3
2. Reduce the partial differential equation \( z^2(p^2+q^2) = x^2+y^2 \) to the form
   \( f(x,p) = g(y,q) \). 2
3. Find \( a_0 \) in the Fourier series expansion of \( f(x) = e^{-x} \) in (-1,1). 2
4. If \( x = \sum_{n=1}^{\infty} b_n \sin nx \), \( 0 < x < \pi \), then find \( b_n \). 3
5. Solve \( py^3+qx^2 = 0 \) by the method of separation of variables. 2
6. Solve \( \frac{\partial^2 u}{\partial x^2} = 4 \frac{\partial^2 u}{\partial y^2} \) u(0,y) = 8e^{-3y}. 3
7. Find the iterative formula to find \( N \) using Newton-Raphson method. 2
8. If \( f(1) = -3, f(3) = 9, f(4) = 30 \) and \( f(6) = 132 \), then find \( f(x) \). 3
9. Find the Z transform of \( \{n a^n\} \). 3
10. Find the convolution \( \{2^n \ast 3^n\} \). 2

PART – B (50 Marks)

11.(a) Solve \( y^2p - xyq = x(z-2y) \). 5
    (b) Solve \( q(q^2+s) = pt \) by Monge’s method. 5
12. Find the Fourier series expansion for \( f(x) = \begin{cases} -\pi, & -\pi < x < 0 \\ x, & 0 < x < \pi \end{cases} \) and hence
    find the sum \( \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \ldots \). 10
13. Solve \( \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, 0 < x, y < \pi \) subject to \( u(0,y) = u(\pi,y) = u(x,\pi) = 0 \)
    and \( u(x,0) = \sin^2 x \). 10
14.(a) Solve the system of equations \( 4x - 3y - 9z + 6w = 0, 2x + 3y + 3z+6w= 6 \)
    and \( 4x - 21y - 39z - 6w = -24 \) by Gauss elimination method. 5
    (b) Find the approximate value of \( y(1.3) \) for \( \frac{dy}{dx} = -2xy^2 \), \( y(1) = 1 \) using Euler’s
    method. 5
15.(a) Find the inverse Z transform of \( \frac{7z-11z^2}{(z-1)(z-2)(z+3)} \). 5
    (b) State and prove convolution theorem of Z transforms. 5
16. Solve \( pxy + pq + qy = yz \) by Charpit’s method. 10
17.(a) Find the Fourier series expansion of \( f(x) = | \cos x | \) in \([-\pi, \pi]\). 5
    (b) Find \( \frac{dy}{dx} \) at \( x = 0.5 \) from the following table.

    | x: 0 1 2 3 |
    | y: 1 3 15 40 |

    ****