

FACULTY OF ENGINEERING
B.E. 2/4 (Common to All Except – IT) I Semester (New) (Main)
Examination, December 2011
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)

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1. Form the partial differential equation by eliminating the arbitrary constants from $z = ax + by + a^2 + b^2$. 3
 2. Form the partial differential equation by eliminating the arbitrary functions from $z = f(x^2 + y^2)$. 3
 3. Define periodic function and give an example. 2
 4. Define even and odd functions. 2
 5. Solve by separation of variables method for $u_x = u_y$. 3
 6. Write the one dimensional heat flow equation and wave equation. 2
 7. Write Regula-Falsi iteration formula to find a root of the equation. 2
 8. Explain Bisection method. 3
 9. Find Z transform of $\{e^{-3n}\}$. 2
 10. Find the Z transform of $(n+1)^2$. 3

PART – B

(5×10=50 Marks)

11. a) Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$. 5
 b) Solve $2z + p^2 + qy + 2y^2 = 0$ by Charpit's method. 5
12. A tightly stretched string with fixed end points $x = 0$ and $x = l$ is initially in a position given by $y = y_0 \sin^3\left(\frac{\pi x}{l}\right)$. If it is released from rest from this position, find the displacement $y(x, t)$. 10

13. Solve $q^2r - 2pqs + p^2t = pq^2$ by Monge's method. 10

14. a) Expand $f(x) = x \sin x$ as a Fourier series. 5

b) Obtain Fourier series for the function $f(x)$ given by $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, & -\pi \leq x \leq 0, \\ 1 - \frac{2x}{\pi}, & 0 \leq x \leq \pi \end{cases}$. 5

15. a) Find the inverse Z transform of $\frac{2z}{(Z-1)(Z^2+1)}$. 5

b) Using the Z-transform, solve

$$u_{n+2} + 4u_{n+1} + 3u_n = 3^n \text{ with } u_0 = 0, u_1 = 1. \quad 5$$

16. a) Using Newton-Raphson method, find a root of the equation $x \sin x + \cos x = 0$. 5

b) Find the first derivative at $x = 1$ for the following values of x and y : 5

$$x: \quad 1 \quad 2 \quad 4 \quad 8 \quad 10$$

$$y: \quad 0 \quad 1 \quad 5 \quad 21 \quad 27$$

17. a) Using Euler's method, find approximate value of y when $x = 0.6$ of $\frac{dy}{dx} = 1 - 2xy$, given that $y = 0$ when $x = 0$ (take $h = 0.2$). 4

b) Using Runge-Kutta method of fourth order,

$$\text{solve } \frac{dy}{dx} = \frac{y^2 - x^2}{y^2 + x^2} \text{ with } y(0) = 1 \text{ at } x = 0.1, 0.2. \quad 6$$