



**FACULTY OF ENGINEERING**  
**B.E. 2/4 I Semester (Old) (Common to all Except IT)**  
**Examination, June 2012**  
**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

1. Form the partial differential equation by eliminating arbitrary constants from  $2z = (ax + y)^2 + b$ . 2
2. Solve  $p^2 - q^2 = x - y$ . 3
3. Write Euler's formulae for Fourier series. 2
4. Find the Fourier Cosine series for the function  $f(x) = 1, 0 < x < 2$ . 3
5. Solve  $4u_x + u_y = 3u$  and  $u(a, y) = e^{-5y}$ . 2
6. Show that  $u = \sin x \sin hy$  is a solution of Laplace's equation. 3
7. Show that  $Z\{1\} = \frac{z}{z-1}$ . 2
8. Show that  $Z\{\cos n\theta\} = \frac{z(z - \cos \theta)}{z^2 - 2z \cos \theta + 1}$ . 3
9. Evaluate  $\int_0^1 \frac{dx}{1+x}$  using trapezoidal rule taking  $h = 0.2$ . 3
10. Write the Newton's forward interpolation formula. 2

**PART – B**

50

11. a) Solve  $x^2 (y - z) p + y^2 (z - x) q = z^2 (x - y)$ . 4
- b) Solve  $y^2 r - 2ys + t = p + 6y$  by Monge's method. 6

(This paper contains 2 pages)

12. a) Find the Fourier series for  $f(x) = x$  in  $-\pi < x < \pi$ . 4  
 b) Express  $f(x) = |x|$ ,  $-\pi < x < \pi$  as Fourier series. 6
13. a) Solve  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$  by separation of variables method. 4  
 b) A tightly stretched string of length  $l$  with fixed ends is initially in equilibrium position. It is set vibrating by giving each point a velocity  $\sin^3 \frac{\pi x}{l}$ . Find the displacement  $y(x, t)$ . 6
14. a) Find  $Z^{-1} \left\{ \frac{z^2}{(z-1)(z-3)} \right\}$  using Z-transformation. 4  
 b) State and prove convolution theorem of Z-transforms. 6
15. a) Apply Gauss elimination method to solve the equations  $x + 4y - z = -5$ ,  
 $x + y - 6z = -12$ ,  $3x - y - z = 4$ . 4  
 b) Compute  $\frac{dy}{dx}$  at  $x = 1.5$  given that 6
- |   |   |   |   |   |    |    |
|---|---|---|---|---|----|----|
| x | 0 | 1 | 2 | 3 | 4  | 5  |
| y | 1 | 2 | 5 | 7 | 12 | 20 |
16. a) Form a partial differential equation by eliminating  $\phi$  from  $\phi(x^2 + y^2, z - xy) = 0$ . 4  
 b) Find the half range Fourier sine series for the function  $f(x) = x$ ,  $0 < x < \pi$ . 6
17. a) Find the inverse Z-transform of  $\frac{z^2}{(z-2)(z-3)}$ . 4  
 b) Obtain  $f(x)$  from the following data 6
- |      |    |    |   |    |    |
|------|----|----|---|----|----|
| x    | -3 | -1 | 0 | 2  | 3  |
| f(x) | -9 | 5  | 3 | 11 | 33 |
- using Newton's divided differences.