

## FACULTY OF ENGINEERING

B.E. 2/4 I Semester (Common to All Except IT) (Main) Examination,  
December 2010

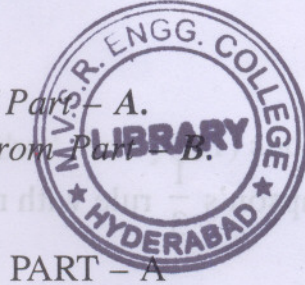
## MATHEMATICS – III

Time : 3 Hours]

[Max. Marks : 75

**Note :** Answer **all** questions of Part – A.

Answer **Five** questions from Part – B.



PART – A

(25 Marks)

1. Form the partial differential equation by eliminating arbitrary function  $f$  from

$$Z = f\left(\frac{xy}{z}\right).$$

3

2. Solve  $(Z - px - qy) pq = p + q$ .

2

3. Write the Euler's formulae.

2

4. Find the Fourier coefficient  $a_0$  in the Fourier series expansion of

$$f(x) = x \sin x \text{ in } [-\pi, \pi].$$

3

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

3

6. Write one and two dimensional wave equations.

2

7. Find the Z transform of  $\langle \cos(n\theta) \rangle$ .

3

$$8. \text{ Find } Z^{-1} \left[ \frac{3z}{(z-3)^2} \right].$$

2



9. Find the Lagrange interpolating polynomial that fits the following data. 3

x	2.5	3.5
f(x)	6	8

10. Evaluate  $\int_1^2 \cos x \, dx$  by Simpson's  $\frac{1}{3}$  rule with  $n = 2$ . 2

## PART - B

(50 Marks)

11. a) Solve  $(y + z)p + (z + x)q = x + y$  5

- b) Solve  $2xz - px^2 - 2xyq + pq = 0$  by Charpit's method. 5

12. a) Find the Fourier sine series of 5

$$f(x) = 1 \text{ in } [0, 2]$$

- b) Find the complex Fourier series of  $f(x) = e^{-x}, -\pi < x < \pi$ . 5

13. Solve  $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}, 0 < x < l, l > 0$ . 5

Subject to  $u(0, t) = u(l, t) = 0$  and  $u(x, 0) = x(l - x)$ . 10

14. a) If  $Z\{f_n\} = F(z) = \frac{3z^3 + 5z^2 - 7z + 1}{(z+2)^2(z-1)}$ , find  $\lim_{n \rightarrow \infty} f_n$ . 5

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

15. a) Perform the first three iterations of Gauss-Seidel iteration method to solve

$$\begin{bmatrix} 4 & 1 & 2 \\ 1 & 5 & 1 \\ 2 & 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ 5 \\ 3 \end{bmatrix}$$

(Max. Marks : 5)

b) Using Runge-kutta 4<sup>th</sup> order method, find  $y(0.1)$  and  $y(0.2)$  for

$$y' = xy + y^2, y(0) = 1.$$

5

(25 Marks)

16. Solve  $r = 25t$  by Monge's method.

10

17. a) Using convolution theorem, find  $Z^{-1} \left[ \frac{z^2}{(z-1)(z-2)} \right]$ .

5

b) Find  $y(1.6)$  from

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

5