FACULTY OF ENGINEERING
B.E. 2/4 I Semester (Common to All Except IT) (Main) Examination, December 2010
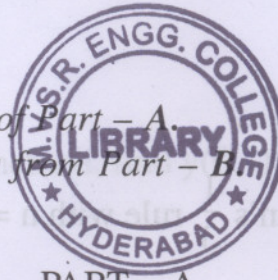## MATHEMATICS – III

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

   $Z = f\left(\dfrac{xy}{z}\right)$.   **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
   $f(x) = x \sin x$ 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. Find $Z^{-1}\left[\dfrac{3z}{(z-3)^2}\right]$.   **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 $2x\, z - px^2 - 2xyq + pq = 0$ by Charpit's method. **5**

12. a) Find the Fourier sine series of

f (x) = 1 in [0, 2] **5**

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

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

Subject to u(0, t) = u(l, t) = 0 and u(x, 0) = x ((l– x). **10**

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

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

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

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

5

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

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

5

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

10

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

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