Code No. : 5003/N

FACULTY OF ENGINEERING AND INFORMATICS
B.E. I Year (New) (Common to all Branches) (Suppl.)
Examination, January 2012
MATHEMATICS – II

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. Eliminate arbitrary constant from
   $y = cx + \frac{1}{c}$, $c \neq 0$ and form a differential equation. 2
2. Find the solution of the differential equation 3
   $(y - x + 1)\, dy - (y + x + 2)\, dx = 0$.
3. Show that functions x, x^2, x^3 are linearly independent on any interval I. 2
4. Solve $y'' + y' - 2y = 0, y(0) = 0, y'(0) = 3$. 3
5. Find the singular points of $x^2y'' + (x + x^2)y' - y = 0$ and classify them. 2
6. Find the value of $T_3(x)$ (Chebyshev polynomial). 3
7. Find the value of $\beta\left(9/2, 7/2\right)$. 2
8. Express $J_3(x)$ in terms of $J_0(x)$ and $J_1(x)$. 3
9. Find Laplace transform of $1 + 2\sqrt{t} + 3\sqrt{t}$. 2
10. Find the inverse Laplace transform of $\frac{S^2 - 3S + 4}{S^3}$. 3

PART – B (5×10=50 Marks)

11. a) Solve the initial value problem $3x^2y^4dx + 4x^3y^3dy = 0$, $y(1) = 2$. 5

    b) Solve the differential equation, $\frac{dy}{dx} - y = y^2 (\sin x + \cos x)$. 5

12. a) Find the general solution of the Riccoti equation. 5

$y' = 4xy^2 + (1-8x)y + 4x - 1$, $y = 1$ is a particular solution.

b) Solve the initial value problem $y''' - 2y'' - 5y' + 6y = 0$, $y(0) = 0, y'(0) = 0, y''(0) = 1$. 5

13. a) Solve $y'' + 4y = \cos^2 x$. 5

b) If $y_1 = e^x$ is one of the solutions of $y'' + 3y' - 4y = 0$, then find general solution, by reducing order of differential equation. 5

14. Find the series solution about $x = 0$ of the equation $(1-x^2)y'' - 2xy' + 6y = 0$. 10

15. a) Show that $\int_{-1}^{1} p_m(x)p_n(x)dx = \begin{cases} 0 \ , & m \neq n \\ \dfrac{2}{2n+1}, & m = n \end{cases}$ 5

b) Evaluate $\int_0^\infty e^{-a^x} n^{m-1} \sin bx \, dx$ interms of Gamma function. 5

16. a) Prove that $\beta(m+1, n) + \beta(m, n+1) = \beta(m, n)$. 5

b) Show that $J_n(x) = \dfrac{1}{\pi}\int_0^\pi \cos(n\theta - x\sin\ n\theta)d\theta$. 5

17. a) Apply convolution theorem to evaluate $L^{-1}\left[\dfrac{s}{(s^2+a^2)^2}\right]$. 5

b) Solve $(D^2 + n^2)x = a\sin(nt + \alpha)$; $x = Dx = 0$ at $t = 0$ using Laplace transform. 5
