**Code No. 2507/CBCS/BL**

# FACULTY OF ENGINEERING
## B.E. II-Semester (CBCS)(Backlog) Examination, November 2020

**Subject : Engineering Mathematics – II**

**Time : 2 Hours** **Max. Marks: 70**

***Note: Answer any five questions from Part-A & any four questions from Part-B.***

### PART – A (5x2=10 Marks)

1 Find the general solution of $y'' + 2y' - 3y = 0$.

2 Solve the differential equation $y^{iv} + 5y'' + 4y = 0$.

3 Determine for what values of a and b, the following differential equation is exact and obtain the general solution of the exact equation $(y + x^3)dx + (ax + by^3)dy = 0$.

4 Find the orthogonal trajectories of the hyperbolas $x^2 – y^2 = c$, c is a constant.

5 Classify the singular points of $x^2y'' + axy' + by =0$, a and b constants.

6 Show that $P_n(- x) = (-1)^n P_n(x)$. Hence find $P_n(-1)$.

7 Evaluate $\int_0^\infty \sqrt{x}\, e^{-x^2} dx$ .

8 Evaluate $\int x^2 J_1(x)\, dx$ in terms of the Bessel's function.

9 Find $L^{-1}\left[\dfrac{2s+5}{s^2+25}\right]$ .

10 Using Laplace transforms of periodic function verify that $L(\sin wt) = \dfrac{W}{w^2+s^2}$ .

### PART – B (4x15=60 Marks)

11 (a) Find the solution of the following systems of the equation using the elimination method $y'_1 + y_2 = 4 \sin t$, $y'_2 + y_1 = 8 \cos t$.

(b) Find the general solution of $(D^3 – 6D^2 + 12D – 8)y = 18e^{2x}$.

12 (a) Find the orthogonal trajectories of the family of curves
(i) $r^2 = c \sin (2\theta)$ (ii) $r = c (\sec \theta + \tan \theta)$

(b) Find the general solution of the differential equation
$y' = y^2 – (2x – 1)y + x^2 – x + 1$ if $y = x$ is a solution of the differential equation.

13 (a) Find a fourth degree polynomial approximate to the solution of the initial value problem $y'' – y = 0$, $(0) =2$, $y'(0) = 0$.

(b) State and prove orthogonal property of legendary polynomials.

14 (a) Prove that $\int_{-1}^{1} (1 - x^2)^n dx = \dfrac{2^{2n+1}(n)^2}{(2n+1)}$ $n$ is positive integer.

(b) Evaluate $\int_0^\infty x^{1/3} e^{-x^2} dx$ .

15 (a) Show that $\int x J_0^2(x)dx = \frac{1}{2}x^2[J_0^2(x) + J_1^2(x)]$.

(b) Show that $2J'_v(x) = J_{v-1}(x) - J_{v+1}(x)$.

16 (a) Solve the initial value problem y′′ - 5y′ + 4y = $e^{2t}$ , y(0)=19/12, y′(0) = 8/3.

(b) Find f(t) as the solution of the integral equation $f(t) = t + e^{-2t} + \int_0^t f(\tau)e^{2(t-\tau)}d\tau$.

17 (a) Solve the initial value problems : y′′ - 2y′ = δ(t – 1), y(0) =1, y′(0)=0, 0 ≤ t ≤ 2.′

(b) Determine a value of the constant $t_0$ such that $\int_0^1 \sin^2[(t - t_0)\delta\left(t - \frac{1}{2}\right) dt = 3/4$.

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