FACULTY OF ENGINEERING

B.E. I – Year (Backlog) Examination, May / June 2017

Subject: Mathematics – II

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (25 Marks)

1 Find an integrating factor of the differential equation $(x^2y – 2xy^2) dx + (3x^2y – x^3) dy = 0$. 3

2 Find the general and singular solutions of the differential equation $y = þx + þ^2$ where

   $þ = \dfrac{dy}{dx}$. 2

3 Solve $(D^3 + 2D^2 – 8D) y = 0$ where $D \equiv \dfrac{d}{dx}$. 3

4 Find a particular integral of $(D^2 – 6D + 9) y = 18 + 54x$. 2

5 Locate and classify the singular points of the differential equation

   $x (1 – x) y'' - (1 + 3x) y' - y = 0$. 3

6 Express $f(x) = 4x^3 + 6x^2 + 5x – 3$ as a linear combination of Legendre polynomials. 2

7 Evaluate $\int\limits_{0}^{\infty} 5^{-7x^2} dx$. 3

8 Evaluate $\dfrac{d}{dx} \{erf(r\ x)\}$. 2

9 Evaluate $L \{t^2 \cosh at\}$. 3

10 Evaluate $L^{-1} \left\{ \dfrac{5s + 10}{9s^2 - 16} \right\}$. 2

PART – B (5x10 = 50 Marks)

11 a) Solve $\dfrac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$. 5

   b) Find the orthogonal trajectories of the family of curves $\dfrac{x^2}{a^2} + \dfrac{y^2}{a^2 +} = 1$ where   is the

      parameter. 5

12 a) Solve $(D^2 – 2D + 5)y = e^{2x} \sin x$. 5

   b) Solve $x^2 \dfrac{d^2y}{dx^2} + x \dfrac{dy}{dx} – 4y = x^2$. 5

13 Solve $x y'' + y' + xy = 0$ by using Frobenius method.   10

14 a) Express $J_4(x)$ in terms of $J_o(x)$, $J_1(x)$.   5

     b) Evaluate $\int_{0}^{\infty} e^{-4x}(1-e^{-x})^2 dx$ in terms of Beta function.   5

15 a) Evaluate $L\left\{\int_{0}^{t} e^u . \dfrac{\sin u}{u} du\right\}$.   5

     b) Evaluate $L^{-1}\left\{\cot^{-1}\left(\dfrac{s+3}{2}\right)\right\}$.   5

16 a) Solve $2xy\, dy - (x^2 + y^2 + 1)\, dx = 0$.   5

     b) Solve $(D^2 - 2D)\, y = e^x \sin x$ by the method of variation of parameters.   5

17 a) Show that $\int_{-1}^{1} \left[P_n(x)\right]^2 dx = \dfrac{2}{2n+1}$.

     b) Using Laplace transform, solve the differential equation $y'' - 6y' + 9y = 0$, $y(0) = 2$,

     $y'(0) = 9$.

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