Code No. 6003 / M

FACULTY OF ENGINEERING and INFORMATICS

B.E. I – Year (Main) Examination, June 2014

Subject : 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 Form the differential equation by eliminating arbitrary constants a, b from $y = ae^{3x} + be^{5x}$. (2)

2 Solve $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ (3)

3 Solve $y'' - y = 0,$ when y = 0 and $y' = 2$ at x = 0. (2)

4 Find the particular integral of $(D^2 + 1)y = 8e^{-x}$. (3)

5 Classify the singular points of $(1 - x^2)y'' - 2xy' + 2y = 0.$ (2)

6 Prove that $P_n(1) = 1$. (3)

7 Show that $J_{-1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x.$ (2)

8 Prove that $\int_0^\infty \frac{x^C}{C^x} dx = \frac{(C+1)}{(\log C)^{C+1}}, C > 1.$ (3)

9 Find the Laplace transform of e^{-t} cost. (2)

10 Find inverse Laplace transform of $\frac{s^2 - s + 2}{s(s-3)(s+2)}$. (3)

PART – B (50 Marks)

11 a) Find the orthogonal trajectories of $r = ce^{\theta}$, where C is the parameter. (5)

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

12 a) Using the method of variation of parameters solve $(D^2+1)\, y = x$. (5)

b) Solve $(D^2 - 4D + 2)\, y = 12e^x \sin 2x$. (5)

13 Obtain the series solution of the equation (10)

$x^2 y'' + xy' + (x^2 - 4)y = 0$ about x = 0,

14 a) Prove that $\beta(m,n) = \frac{\Gamma m \Gamma n}{\Gamma(m+n)}$ (5)

b) Prove that $\int J_0(x)\ J_1(x)\, dx = -\frac{1}{2} J_0^2(x).$ (5)

15 a) Apply convolution theorem to evaluate (5)

$$L^{-1}\left[\frac{1}{(s^2+1)(s^2+4)}\right].$$

b) Use Laplace transform to solve $y' - y = e^x$ given that y(0) = 1. (5)

16 a) Find the general solution and singular solution of the Clairaut's equation y = (x – a) p – p^2. (5)

b) Solve the initial value problem $y'' - 2y' + 3y = 0$ with y(0) = 1, $y'(0) = 0$. (5)

17 a) Prove that $\int_{-1}^{1} P_m(x)P_n(x)dx = 0$ if $m \neq n$. (5)

b) Find the Laplace transform of t $\sin^2(3t)$. (5)

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