

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 $\frac{dy}{dx} = \frac{y}{x} + x^2$ (3)
- 3 Solve $y'' - y = 0$, when $y = 0$ and $y' = 1$ at $x = 0$. (2)
- 4 Find the particular integral of $(D^2 + 1)y = 8e^{-x}$. (3)
- 5 Classify the singular points of $(1 - x^2)y'' + 2xy' = 0$ (2)
- 6 prove that $P_n(1) = 1$. (3)
- 7 Show that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \cos x$. (2)
- 8 Prove that $\lim_{C \rightarrow 1} \frac{J_0(Cx)}{J_0(C)} = \frac{(C+1)}{2C}$, $C > 1$. (3)
- 9 Find the Laplace transform of $e^{-t} \cos t$. (2)
- 10 Find inverse Laplace transform of $\frac{1}{s(s-3)(s+2)}$ (3)

PART — B (50 Marks)

- 11 a) Find the orthogonal trajectories of $r = ce^{\theta}$, where C is the parameter. (5)
- b) Solve $\frac{dy}{dx} = y^2 (\sin x + \cos x)$. (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 $x^2 y'' + xy' + y = 0$ about $x = 0$, (10)
- 14 a) Prove that $\int_0^1 x f(x) dx = \frac{1}{2} f(0) + \frac{1}{6} f'(0) + \dots$ (5)
- b) Prove that $\int_0^1 f(x) dx = \frac{1}{2} f(0) + \frac{1}{6} f'(0) + \dots$ (5)

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 15 a) Apply convolution theorem to evaluate (5)

$$\left| \frac{(s^2 + 1)(s^2 + 4)}{(s^2 + 1)(s^2 + 4)} \right|$$

 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 $-2y' = 0$ with $y(0) = 1, y'(0) = 0$. (5)

 17 a) Prove that $f_{i,j}(x) = 0$ if $m \neq n$. (5)

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

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