Roll No. 2 0 0 5 0 6 1

TMA–201

B. Tech. (Second Semester)

Mid Semester EXAMINATION, 2014

(All Branches)

ENGINEERING MATHEMATICS—II

Time : Two Hours] [*Maximum Marks : 60*

Note : (i) This question paper contains two Sections : Section A and Section B.

(ii) Answer all questions in Section A by choosing the correct option from multiple choices. Each question carries 2 marks.

(iii) Answer any *four* questions from Section B. Each question carries 12 marks.

Section—A 2 each

1. Attempt all multiple choice questions, choosing the correct option.

(i) The integrating factor of the equation :

$$\frac{dy}{dx} = \frac{y\,(xy + 2\,x^2y^2)}{x\,(x^2y^2 - xy)}$$

(a) $\frac{1}{3\,x^2y^2}$

(b) $\frac{1}{3\,xy}$

(c) $\frac{-1}{3\,x^2y^2}$

(d) None of these

(ii) The solution of differential equation $(D^2 - 2D^2 + 5)y = 0$ is :

(a) $c_1 e^{x} + c_2 e^{2x}$

(b) $c_1 e^{-x} + c_2 e^{2x}$

(c) $e^{x}(c_1 \cos 2x + c_2 \sin 2x)$

(d) None of these

(iii) $\frac{1}{f(D)} x^n \cos ax$ is equal to :

(a) Real part of $e^{iax} \frac{1}{f(D+ia)} x^n$

(b) Imaginary part of $e^{iax} \frac{1}{f(D+ia)} x^n$

(c) $e^{iax} \frac{1}{f(D+ia)} x^n$

(d) None of these

(iv) Laplace transform of $9 \sin 2t \cos 3t$ is :

(a) $\frac{18(s^2+5)}{(s^2+25)(s^2+1)}$

(b) $\frac{18(s^2-5)}{(s^2+25)(s^2+1)}$

(c) $\frac{18(s^2-5)}{(s^2-25)(s^2+1)}$

(d) None of these

(v) If $L\{F(t)\} = f(s)$, then $L\left\{\frac{1}{t} F(t)\right\}$ is equal to :

(a) $\int_0^s f(s)\, ds$

(b) $\int_s^\infty f(s) ds$

(c) $\int_0^\infty f(s) ds$

(d) None of these

(vi) $L^{-1}\{f(s)\} = F(t)$, then $L^{-1}\{f(s+a)\}$ is equal to :

(a) $e^{-at} L^{-1}\{f(s)\}$

(b) $L^{-1}\{f(s)\}$

(c) $e^{at} L^{-1}\{f(s)\}$

(d) None of these

Section—B

12 (6+6) each

Note : Attempt any *four* of the following questions.

2. (a) Solve :

$$(y \log y)\, dx + (x - \log y)\, dy = 0$$

(b) Solve :

$$(D^4 - 16)\, y = e^{x} \cos x$$

3. (a) Solve :

$$y'' - 4y' + 4y = 8x^2 e^{2x} \sin 2x$$

(b) Solve :

$$x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = x + \log x$$

4. (a) Solve by variation of parameters :

$$(D^2 + 1)\, y = \operatorname{cosec} x$$

(b) In an L-C-R circuit the charge q on a plate of a condenser is given by $L \frac{d^2q}{dt^2} + R \frac{dq}{dt} + \frac{q}{C} = E \sin pt$. The circuit is turned to resonance so that $p^2 = \frac{1}{LC}$. If initially the current i and the charge q be zero, show that, for small values of $\frac{R}{L}$, the current in the circuit at time t is given by $\left\{\frac{Et}{2L}\right\} \sin pt$.

5. (a) Evaluate the Laplace transform of $4 \cosh 2t \sin 4t$.

(b) Obtain the Laplace transform of $\frac{\cos at - \cos bt}{t}$.

6. (a) Use convolution theorem to find the inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$.

(b) Find the inverse Laplace transform of $\frac{s\, e^{-s/2} + \pi e^{-s}}{s^2 + \pi^2}$ in terms of unit step function.

7. (a) A particle moves in a line so that its displacement x from a fixed point at any time t, is given by $\frac{d^2x}{dt^2} + 4\frac{dx}{dt} + 5x = 80\sin 5t$. Using the Laplace transformation, find its displacement at any time t if initially particle is at rest at $x = 0$ i. e. $x(0) = 0, x'(0) = 0$.

(b) Find :

$$L^{-1}\left\{\log\left(\frac{s^2-1}{s^2}\right)\right\}$$

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