CBCS SCHEME

USN

15MAT21

Second Semester B.E. Degree Examination, July/August 2021
Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions.***

1 a. Solve : $\frac{d^3y}{dx^3}+3\frac{d^2y}{dx^2}+3\frac{dy}{dx}+y=6e^{-x}+7$. **(06 Marks)**

b. Solve : $(D^2-4D+13)y=e^{2x}\cos 3x$. **(05 Marks)**

c. Solve : $y'''+y'=x^2+e^{3x}$ by using the method of undetermined co-efficients. **(05 Marks)**

2 a. Solve : $\frac{d^2x}{dt^2}-4\frac{dx}{dt}+13x=x^2$. **(06 Marks)**

b. Solve : $y''-2y'+y=xe^x\sin x$. **(05 Marks)**

c. Solve : $(D^2+1)y=\text{cosec}x.\cot x$ using method of variation of parameter. **(05 Marks)**

3 a. Solve : $x^2y'''+3xy''+y'=x^2\log x$. **(06 Marks)**

b. Solve : $xyp^2+p(3x^2-2y^2)-6xy=0$. **(05 Marks)**

c. Solve : $p^3-4xyp+8y^2=0$. **(05 Marks)**

4 a. Solve : $(1+2x)^2y''-2(1+2x)y'-12y=6x$. **(06 Marks)**

b. Solve : $y+px=p^2x^4$. **(05 Marks)**

c. Reduce to Clairaut's form using substitution $x^2=u$ and $y^2=v$ and solve :
$(px-y)(x-py)=2p$. **(05 Marks)**

5 a. Construct partial differential equation of, $z=yf(x)+xg(y)$. **(06 Marks)**

b. Solve : $\frac{\partial^2 z}{\partial t\partial x}=e^{-2t}.\cos 3x$ subject to the conditions $z(x,0)=0$ and $z_t(0,t)=0$. **(05 Marks)**

c. Obtain various possible solution of $\frac{\partial u}{\partial t}=C^2\frac{\partial^2 u}{\partial x^2}$. **(05 Marks)**

6 a. Form a partial differential equation by eliminating the arbitrary function from,
$\phi[x^2+y^2+z^2, z^2-2xy]=0$. **(06 Marks)**

b. Solve : $Z_{xx}+4z=0$ given that at $x=0$, $z=e^{2y}$ and $z_x=2$. **(05 Marks)**

c. Derive one-dimensional wave equation in the form $\frac{\partial^2 u}{\partial t^2}=C^2\frac{\partial^2 u}{\partial x^2}$. **(05 Marks)**

7 a. Evaluate : $\iint_R y\,dx\,dy$ where R is the region bounded by the parabolas $y^2 = 4x$ and $x^2 = 4y$. **(06 Marks)**

b. Evaluate : $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\,dz\,dy\,dx$. **(05 Marks)**

c. Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. **(05 Marks)**

8 a. Evaluate $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy\,dx$ by changing order of integration. **(06 Marks)**

b. Find the volume generated by the revolution of the cardioids $r = a(1+\cos\theta)$. **(05 Marks)**

c. Show that $\int_0^{\pi/2} \sqrt{\sin\theta}\,d\theta \times \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$. **(05 Marks)**

9 a. Find (i) $L[\cos t \quad \cos 2t \quad \cos 3t]$. (ii) $L\left[\frac{e^{at} - e^{bt}}{t}\right]$ **(06 Marks)**

b. Find $L[f(t)]$ of

$$f(t) = \begin{cases} E\sin\omega t & 0 \le t < \frac{\pi}{w} \\ 0 & \frac{\pi}{w} \le t \le \frac{2\pi}{w} \end{cases}.$$

where $f\left(t + \frac{2\pi}{w}\right) = f(t)$.

Q, E and w are constant. **(05 Marks)**

c. Find the inverse Laplace transform of, $F(s) = \frac{4s+5}{(s+1)^2(s+2)}$. **(05 Marks)**

10 a. Find (i) $L[e^{-t}(2\cos 5t - 3\sin 5t)]$ (ii) $L[t^3 \cosh at]$ **(06 Marks)**

b. Using convolution theorem, find inverse Laplace transform of $\frac{1}{(s+1)(s^2+1)}$. **(05 Marks)**

c. Solve using Laplace transform, $\frac{d^2y}{dt^2} + 4\frac{dy}{dt} + 4y = e^{-t}$ given $y(0) = 0$ and $y'(0) = 0$. **(05 Marks)**

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