14MAT21

Second Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Mathematics – II

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
at least ONE question from each part.

Module-1

1 a. Solve : $\dfrac{d^4y}{dx^4} + a^4y = 0$.   (06 Marks)

   b. Solve : $(D-2)^2 y = 8(e^{2x} + \sin 2x + x^2)$.   (07 Marks)

   c. Using the method of variation of parameters solve $\dfrac{d^2y}{dx^2} + 4y = \tan 2x$.   (07 Marks)

2 a. Solve $(D^4 + 4D^3 - 5D^2 - 36D - 36)y = 0$.   (06 Marks)

   b. Solve : $\dfrac{d^2y}{dx^2} + 4y = x \sin x + \sin 2x$.   (07 Marks)

   c. Solve by the method of undetermined coefficients $(D^2 - 2D)y = e^x \sin x$.   (07 Marks)

Module-2

3 a. Solve : $x^2 \dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + y = \log x$.   (06 Marks)

   b. Solve : $P^2 + 2 p y \cot x = y^2$.   (07 Marks)

   c. Find the general and singular solution of the equation $\sin p x \cos y = \cos p x \sin y + p$.   (07 Marks)

4 a. Solve : $\dfrac{dx}{dt} - 7x + y = 0, \quad \dfrac{dy}{dt} - 2x - 5y = 0$.   (06 Marks)

   b. Solve : $(1+x)^2 \dfrac{d^2y}{dx^2} + (1+x)\dfrac{dy}{dx} + y = 2\sin\{\log(1+x)\}$.   (07 Marks)

   c. Solve : $y - 2px = \tan^{-1}(x\,p^2)$.   (07 Marks)

Module-3

5 a. Solve : $\dfrac{\partial^2 z}{\partial x \partial y} = \sin x \sin y$ for which $\dfrac{\partial z}{\partial y} = -2\sin y$ when $x = 0$ and $z = 0$ when y is an odd

   multiple of $\dfrac{\pi}{2}$.   (06 Marks)

   b. Obtain the solution of one dimensional heat equation $\dfrac{\partial u}{\partial t} = c^2 \dfrac{\partial^2 u}{\partial x^2}$ by the method of

   separation of variables.   (07 Marks)

   c. Evaluate : $\displaystyle\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \dfrac{dz\,dy\,dx}{\sqrt{1-x^2-y^2-z^2}}$.   (07 Marks)

6 a. Form the partial differential equation by eliminating the arbitrary function form :
        $Z = y\,f(x) + x\,g(y)$.   **(06 Marks)**

   b. Solve $\dfrac{\partial^2 z}{\partial x^2} = a^2 z$ given that when $x = 0$, $\dfrac{\partial z}{\partial x} = a\sin y$ and $\dfrac{\partial z}{\partial y} = 0$.   **(07 Marks)**

   c. Change the order of integration in $\displaystyle\int_{0}^{1}\int_{x^2}^{2-x} x\,y\,dx\,dy$ and hence evaluate the same.   **(07 Marks)**

Module-4

7 a. Find the area of the ellipse $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} = 1$, by double integration.   **(06 Marks)**

   b. Prove that $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$.   **(07 Marks)**

   c. Express the vector $zi - 2xj + yk$ in cylindrical coordinates.   **(07 Marks)**

8 a. Find the volume generated by the revolution of the Cardioide $r = a(1 + \cos\theta)$ about the initial line.   **(06 Marks)**

   b. Prove that $\displaystyle\int_{0}^{\pi/2}\sqrt{\sin\theta}\,d\theta \times \int_{0}^{\pi/2}\dfrac{d\theta}{\sqrt{\sin\theta}} = \pi$ **(07 Marks)**

   c. Prove that Spherical polar coordinate system is orthogonal.   **(07 Marks)**

Module-5

9 a. Find $L\left\{e^{-t}\dfrac{\sin t}{t}\right\}$.   **(06 Marks)**

   b. Draw the graph of the periodic function : $f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$.

       Where $f(t + 2\pi) = f(t)$ find $L\{f(t)\}$.   **(07 Marks)**

   c. Using convolution theorem, evaluate $L^{-1}\left\{\dfrac{s}{(s^2 + a^2)^2}\right\}$.   **(07 Marks)**

10 a. Find : $L\left\{\left(\sqrt{t} - \dfrac{1}{\sqrt{t}}\right)^3\right\}$.   **(06 Marks)**

   b. Express $f(t) = \begin{cases} \sin t, & 0 < t \le \dfrac{\pi}{2} \\ \cos t, & t > \dfrac{\pi}{2} \end{cases}$

       interms of unit step function and hence find $L\{f(t)\}$.   **(07 Marks)**

   c. Solve : $y''' + 2y'' - y' - 2y = 0$, using Laplace transforming with $y(0) = y'(0) = 0$, $y''(0) = 6$.   **(07 Marks)**

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