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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 : $\frac{d^4y}{dx^4} + a^4y = 0$. **(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 $\frac{d^2y}{dx^2} + 4y = \tan 2x$. **(07 Marks)**

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

b. Solve : $\frac{d^2y}{dx^2} + 4y - x\sin x + \sin 2x$. **(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 : $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = \log x$. **(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 $\sin px\cos y = \cos px\sin y + p$. **(07 Marks)**

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

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

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

Module-3

5 a. Solve : $\frac{\partial^2 z}{\partial x\partial y} = \sin x \sin y$ for which $\frac{\partial z}{\partial y} = -2\sin y$ when $x = 0$ and $z = 0$ when y is an odd multiple of $\frac{\pi}{2}$. **(06 Marks)**

b. Obtain the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ by the method of separation of variables. **(07 Marks)**

c. Evaluate : $\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}} \frac{dz\,dy\,dx}{\sqrt{1-x^2-y^2-z^2}}$. **(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 $\frac{\partial^2 z}{\partial x^2} = a^2 z$ given that when $x = 0$, $\frac{\partial z}{\partial x} = a \sin y$ and $\frac{\partial z}{\partial y} = 0$. (07 Marks)

c. Change the order of integration in $\int_0^1 \int_{x^2}^{2-x} x\, y\, dx\, dy$ and hence evaluate the same. (07 Marks)

Module-4

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

b. Prove that $\beta(m,n) = \frac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$. (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 $\int_0^{\pi/2} \sqrt{\sin\theta}\, d\theta \times \int_0^{\pi/2} \frac{d\theta}{\sqrt{\sin\theta}} = \pi$ (07 Marks)

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

Module-5

9 a. Find $L\left\{e^{-t} \frac{\sin t}{t}\right\}$. (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 $L^{-1}\left\{\frac{s}{(s^2 + a^2)^2}\right\}$. (07 Marks)

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

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

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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