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USN

14MAT21

Second Semester B.E. Degree Examination, Dec.2019/Jan.2020

Engineering Mathematics – II

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Solve : $y'' + 3y' + 2y = 1 - 2e^x + e^{2x}$. **(06 Marks)**

b. Solve : $y'' + 2y = x^2$. **(07 Marks)**

c. Solve : $y'' + y = \operatorname{cosec} x$ by method of variation of parameter. **(07 Marks)**

OR

2 a. Solve $(D^3 - 6D^2 + 11D - 6)y = 0$. **(06 Marks)**

b. Solve : $(D^2 - 1)y = \sin 2x$. **(07 Marks)**

c. Solve by the method of undetermined coefficient $(D^2 + D - 2)y = x$. **(07 Marks)**

Module-2

3 a. Solve $x^2 \frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 4y = x^2 + 1$. **(06 Marks)**

b. Solve for P, given that $y\left(\frac{dy}{dx}\right)^2 + (x - y)\frac{dy}{dx} - x = 0$. **(07 Marks)**

c. Solve the equation (px – y) (x – py) = 2p. Reducing it into Clairauts form by taking a substitution $U = x^2$ and $V = y^2$. **(07 Marks)**

OR

4 a. Solve : $(1 + x)^2 y'' + (1 + x)y' + y = \sin 2[\log(1 + x)]$. **(06 Marks)**

b. Solve the system of equations $\frac{dx}{dt} = 3x - 4y$, $\frac{dy}{dx} = x - y$. **(07 Marks)**

c. Find the general and singular solution for $\sin px \cos y = \cos px \sin y + p$. **(07 Marks)**

Module-3

5 a. Form partial differential equation by eliminating arbitrary function from $f(x^2 + y^2, z - xy) = 0$. **(06 Marks)**

b. Evaluate : $\int_0^a\int_0^b\int_0^c xyz\, dx\, dy\, dz$. **(07 Marks)**

c. Obtain the solution of one dimensional wave equation by variable separable method. **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

OR

6 a. Solve : $\frac{\partial^2 z}{\partial x \partial y} = \frac{x}{y} + a$. **(06 Marks)**

b. Evaluate : $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx$ by changing the order of integration. **(07 Marks)**

c. Derive one dimensional heat equation in the form $u_t = c^2 u_{xx}$. **(07 Marks)**

Module-4

7 a. Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$. **(06 Marks)**

b. Obtain the relation a between Beta and Gamma function on the form $p(m,n) = \frac{\Gamma m . \Gamma n}{\Gamma m+n}$. **(07 Marks)**

c. Express the vector $\vec{A} = z\hat{i} - 2x\hat{j} + y\hat{k}$ in cylindrical coordinates. **(07 Marks)**

OR

8 a. Show that $\int_{-1}^{1}(1+x)^{p-1}(1-x)^{q-1}dx = 2^{p+q-1}\beta(p,q)$. **(06 Marks)**

b. Find the volume of the tetrahedron bounded by the planes x = 0, y = 0, z = 0, $\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$ **(07 Marks)**

c. Express divergence of $\vec{F}$ where $\vec{F} = x\hat{i} - y\hat{j} + z\hat{k}$ in spherical polar co-ordinates. **(07 Marks)**

Module-5

9 a. Find i) $L\{e^{2t} + 4t^3 + 3\cos 3t\}$ ii) $L\left\{\frac{\sin t}{t}\right\}$. **(06 Marks)**

b. Find the Laplace transfer of the triangular wave of period 2a given by $f(t) = \begin{cases} t & 0 < t < a \\ 2a - t & a < t < 2a \end{cases}$. **(07 Marks)**

c. Solve y′ + y = t by using Laplace transformation, given y(0) = 0. **(07 Marks)**

OR

10 a. Find the inverse Laplace transforms of :

i) $\log\left(\frac{s+1}{s-1}\right)$ ii) $\frac{2s-4}{4s^2+25}$. **(06 Marks)**

b. Express $f(t) = \begin{cases} 0 & 0 < t < 1 \\ t-1 & 1 < t < 2 \\ 1 & t > 2 \end{cases}$ in terms of unit step function and hence find its Laplace transformation. **(07 Marks)**

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

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