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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B.E. - Semester End Examination; May/ June - 2019

Engineering Mathematics - II

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Find for what value of k the system of equation possesses a solution, $x+y+z=1,\ x+2y+4z=k,\ x+4y+10z=k^2$. Solve completely in each case. 6

b. Solve LU decomposition method to solve the system of equations, $2x+y+4z=12,\ 4x+11y-z=33,\ 8x-3y+2z=20.$ 7

c. Find all the Eigen values and the Eigen vector corresponding largest Eigen value of the matrix $A=\begin{bmatrix}-2 & 2 & -3\\ 2 & 1 & -6\\ -1 & -2 & 0\end{bmatrix}$ 7

2 a. Solve the following system of equations by Gauss Jordan method, $x+y+z=9,\ x-2y+3z=8,\ 2x+y-z=3.$ 6

b. Diagonalize the matrix $\begin{bmatrix}-1 & 3\\ -2 & 4\end{bmatrix}$. 7

c. Reduce the following quadratic form into canonical form by orthogonal transformation, $8x^2+7y^2+3z^2-12xy+4xz-8yz.$ 7

UNIT - II

3 a. Solve: $\left(D^3+6D^2+11D+6\right)y=0.$ 6

b. Solve: $\left(D^2-2D+5\right)y=e^{2x}\sin x.$ 7

c. Solve: $y''+a^2y=\sec ax$ by the method of variation of parameters. 7

4 a. Solve: $y''+2y'+y=2x+x^2.$ 6

b. Solve: $y''+3y'+2y=12x^2$ by the method of undetermined coefficients. 7

c. Solve: $(2x+1)^2y''-6(2x+1)y'+16y=8(2x+1)^2.$ 7

UNIT - III

5 a. Find the Laplace transform of, i) $t\cosh t$ ii) $\frac{\sin at}{t}$ 6

b. Given $f(t)=\begin{cases}E, & 0<t<\frac{a}{2}\\ -E, & \frac{a}{2}<t<a\end{cases}$

Where $f(t+a)=f(t)$ show that $L\left[f(t)\right]=\frac{E}{S}\tanh\left(\frac{as}{4}\right).$ 7

Contd…2

c. Express the following in-terms of unit step function and hence find its Laplace transform,

$$f(t)=\begin{cases}\cos t, & 0<t\le\pi\\ 1, & \pi<t\le 2\pi\\ \sin t, & t>2\pi\end{cases}$$ 7

6 a. Find the inverse Laplace transform of, i) $\dfrac{s+5}{s^2-6s+13}$ ii) $\cot^{-1}\left(s/a\right)$. 6

b. Find inverse Laplace transform of $\dfrac{s+2}{\left(s^2+4s+5\right)^2}$ using Convolution theorem. 7

c. Solve: $x''-2x'+x=e^{2t}$ with $x(0)=0,\ x'(0)=-1$ by using Laplace transform method. 7

UNIT - IV

7 a. If $u=\sqrt{x_1x_2},\ v=\sqrt{x_2x_3},\ w=\sqrt{x_3x_1}$ find $J\dfrac{(u,v,w)}{(x_1,x_2,x_3)}$. 6

b. Expand: xy^2+x^2y in powers of $(x-1)$ and $(y+3)$ upto second degree terms. 7

c. Find the minimum value of $x^2+y^2+z^2$ subject to the condition $ax+by+cz=P$. 7

8 a. If $\vec{F}=\left(3x^2+6y\right)i-14yzj+20xz^2k,$ evaluate $\int \vec{F}.\overrightarrow{dr}$ from (0, 0, 0) to (1, 1, 1) along the curve given by $x=t, y=t^2, z=t^3$. 6

b. Employ Green's theorem in a plane to show that the area enclosed by a plane curve c is $\dfrac{1}{2}\oint xdy-ydx$ and hence find the area of the ellipse $\dfrac{x^2}{a^2}+\dfrac{y^2}{b^2}=1.$ 7

c. Verify Stoke's theorem for $\vec{F}=\left(x^2+y^2\right)i-2xyj$ taken around the rectangle bounded by $x=0,\ x=a,\ y=0, y=b.$ 7

UNIT - V

9 a. Evaluate: $\int_{-c}^{c}\int_{-b}^{b}\int_{-a}^{a}\left(x^2+y^2+z^2\right)dzdydx.$ 6

b. Evaluate: $\iint xy(x+y)\,dydx$ take over the area between $y=x^2$ and $y=x$. 7

c. Evaluate: $\int_{-2}^{2}\int_{0}^{\sqrt{4-x^2}}(2-x)\,dydx$ by changing the order of integration. 7

10 a. Find the area enclosed by the curve $r=a(1+\cos\theta)$ between θ = 0 and θ = π by double integration. 6

b. Find the volume of tetrahedron bounded by the planes,

$$x=0, y=0, z=0,\quad x/a+y/b+z/c=1.$$ 7

c. Express the integral in-terms of beta function and hence evaluate $\int_0^2 \dfrac{x^2}{\sqrt{2-x}}\,dx$. 7

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