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

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester, B.E. - Semester End Examination; June - 2016

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. Test for consistency and hence solve the following system of linear equations, $2x+y+z=10,\quad 3x+2y+3z=18,\quad x+4y+9z=16$. 6

b. Solve the system of equations by using Gauss-Jordan Method: $4x+3y+z=13;\quad 2x-y-z=-3;\quad 7x+y-3z=0$. 7

c. Solve the following linear equation : $2x+3y+z=9;\quad x+2y+3z=6;\quad 3x+y+2z=8$, by LU-decomposition method. 7

2 a. Find all the Eigen values and Eigen vector corresponding to the largest Eigen value of the matrix

$$A=\begin{pmatrix}1 & -3 & 3\\ 3 & -5 & 3\\ 6 & -6 & 4\end{pmatrix}$$ 6

b. Find the inverse of the matrix using Cayley-Hamilton theorem

$$\begin{pmatrix}1 & 1 & 3\\ 1 & 3 & -3\\ -2 & -4 & -4\end{pmatrix}$$ 7

c. Find the model Matrix P which diagonalizes the matrix $\begin{bmatrix}2 & 6\\ 0 & -1\end{bmatrix}$. 7

UNIT - II

3 a. Solve: $\dfrac{d^4y}{dx^4}+4y=0$. 6

b. Solve: $\left(D^2+3D+2\right)y=2x^2+4x+1$. 7

c. Solve: $y''-4y'=x\sinh x$. 7

4 a. Solve: $y''-2y'+y=e^x\log x$ by the method of variation of parameter. 6

b. Solve: $y''+y=2\cos x$ by the method of undetermined coefficients. 7

c. Solve: $(1+x)^2\dfrac{d^2y}{dy^2}+(1+x)\dfrac{dy}{dx}+y=2\sin\left[\log(1+x)\right]$. 7

UNIT - III

5 a. Find Laplace transform of :

i) $t\,e^{-t}\sin 3t$

ii) $\dfrac{1-\cos 2t}{t}$ 6

Contd…2

b. Define a unit of step function. Using this, find the Laplace transform of $f(t) = t^2 \ for \ 0 < t \le 2 \ and \ f(t) = 0 \ for \ t > 2$. 7

c. Find the Laplace transform,

$$f(t) = \begin{cases} \sin wt & 0 < t < \pi/w, \\ 0, & \pi/w < t < 2\pi/w \end{cases} \quad \text{and} \quad f\left(t + 2\pi/w\right) = f(t).$$ 7

6 a. Find the Inverse Laplace transform of the following :

$$\frac{5s+3}{(s-1)(s^2+2s+5)}$$ 6

b. Find $L^{-1}\left\{\frac{s}{(s^2+1)(s^2+4)}\right\}$ by using convolution theorem. 7

c. Solve: $y'' + 4y' + 4y = e^{-t}$ $y(0) = y'(0) = 0$ by Laplace transform method. 7

UNIT - IV

7 a. Find the possible percentage error in computing the resistance '*r*' from the formula,

$\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2}, if \ r_1, \ r_2$ are both in error by 2%. 6

b. Expand $e^{ax} \cos by$ in Taylor Series upto second degree terms about the origin. 7

c. Find the stationary value of $x^2 y^3 z^4$ subject to the condition $x + y + z = 5$. 7

8 a. If $F = (5xy - 6x^2)\hat{i} + (2y - 4x)\hat{j}$, Evaluate $\int_c F.dr$ along the curve C in the xy - plane, $y = x^3$ from the point $(1,1) \ to \ (2,8)$. 6

b. Apply Green theorem to evaluate $\int_c (2x^2 - y^2)dx + (x^2 + y^2)dy$ where C is the boundary of the area enclosed by x-axis and the upper-half of the circle $x^2 + y^2 = a^2$. 7

c. Evaluate by using Gauss Divergence theorem $\iint_s (yz\hat{i} + zx\hat{j} + xy\hat{k}).\hat{n}ds$ where s is the surface of the sphere $x^2 + y^2 + z^2 = a^2$ in the first Octant. 7

UNIT - V

9 a. Evaluate: $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dx \ dy \ dz$. 6

b. Evaluate: $\iint_R xy(x+y)dxdy$ over the area between $y = x^2 \ and \ y = x$. 7

c. Evaluate: $\int_0^\infty \int_0^x xe^{-x^2/y} dxdy$ by change the order of integration. 7

10 a. Find the area of the circle $x^2 + y^2 = a^2$ by double integration. 6

b. Find the volume of the tetrahedron bounded by the planes $x = 0, y = 0, z = 0 \ and \ x + y + z = 1$. 7

c. Using Beta and Gamma function Show that,

$$\int_0^{\frac{\pi}{2}} \sqrt{\cot\theta} \ d\theta = \frac{\pi}{2}$$ 7

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