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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; June - 2017

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 solve the following system of linear equations : $2x+y+4z=12$, $4x+11y-z=33$, $8x-3y+2z=20$. 6

b. Apply Gauss-Jordan method to solve the system of equations : $2x+5y+7z=52$, $2x+3y-z=0$, $x+y+z=9$. 7

c. Solve the following linear equations by L-U decomposition method : $x+y+z=9$, $2x-3y+4z=13$, $3x+4y+5z=40$. 7

2 a. Find all the Eigen values and the Eigen vector corresponding to the largest Eigen value of the matrix 6

$$A=\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}.$$

b. Find the inverse of the matrix of using Cayley-Hamilton theorem $A=\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$. 7

c. Find the modal matrix P which diagonalizes the matrix

$A=\begin{bmatrix} 2 & 6 \\ 0 & -1 \end{bmatrix}$ and hence find the diagonal matrix D. 7

UNIT - II

3 a. Solve: $\left(D^4-2D^3+5D^2-8D+4\right)y=0$. 6

b. Solve: $y''+2y'+y=2x+x^2$. 7

c. Solve: $\left(D^2-2D+1\right)y=x\cos x$. 7

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

b. Solve: $y''+4y=x^2+e^{-x}$, by the method of undetermined coefficients. 7

c. Solve: $(3x+2)^2\, y''+3(3x+2)\, y'-36y=3x^2+4x+1$. 7

UNIT - III

5 a. Find the Laplace transform of : (i) $te^{-2t}\cos 2t$ (ii) $\dfrac{e^{-at}-e^{-bt}}{t}$. 6

b. Derive a unit step function. Using this, find the Laplace transform of, 7

$$f(t)=\begin{cases} t^2, & 0<t<2 \\ 4t, & t>2 \end{cases}$$

Contd…2

c. A periodic function $f(t)$ of period $2a$ is defined by, 7

$f(t)=\begin{cases} a & for\ 0\le t<a \\ -a & for\ a\le t\le 2a \end{cases}$ Show that $L\{f(t)\}=\frac{a}{s}\tanh\left(\frac{as}{2}\right)$.

6 a. Find the Inverse Laplace transform of : $\frac{3s+1}{(s-1)(s^2+1)}$. 6

b. Solve $L^{-1}\left\{\frac{S^2}{(S^2+a^2)(S^2+b^2)}\right\}$, by using convolution theorem. 7

c. Solve by using Laplace transform $\frac{d^2y}{dt^2}-\frac{3dy}{dt}+2y=4e^{2t}$, given that $y(0)=-3,\ y'(0)=5$. 7

UNIT - IV

7 a. Find the percentage error in the area of an ellipse, when an error of +1% is made in measuring the major and minor axis. 6

b. Expand $\tan^{-1}\left(y/x\right)$ about the point (1, 1) using Taylor's theorem upto the second degree terms. 7

c. Find the extreme values of the function $x^3y^2(1-x-y)$. 7

8 a. Evaluate $\int_c \vec{F}.\vec{dr}$ where $\vec{F}=x\,y\,i+(x^2+y^2)\,j$ along 6

(i) The path of straight line from (0, 0) to (1, 0) and then to (1,1)

(ii) The straight line joining the origin and (1, 2).

b. Verify Green's theorem for $\oint_c (xy+y^2)\,dx+x^2dy$ where C is the closed curve of the region bounded by $y=x$ and $y=x^2$. 7

c. Evaluate $\int_c xy\,dx+xy^2dy$ by Stoke's theorem where C is the square in the *x-y* plane with vertices (1, 0), (-1, 0), (0, 1), (0, -1). 7

UNIT - V

9 a. Evaluate $\int_0^1\int_0^{1-x}\int_0^{1-x-y}\frac{dz\,dy\,dx}{(1+x+y+z)^3}$ 6

b. Evaluate $\iint_R x^2y\,dx\,dy$ where R is the region bounded by the lines $y=x,\ x+y=2$ and $y=0$. 7

c. Change the order of integration and hence evaluate $\int_0^{4a}\int_{x^2/4a}^{2\sqrt{ax}} xy\,dy\,dx$. 7

10a. Evaluate $\int_0^\infty\int_0^\infty e^{-(x^2+y^2)}dx\,dy$, by changing to polar coordinates. 6

b. Find the area of the ellipse by double integration. 7

c. Show that : $\int_0^{\pi/2}\frac{d\theta}{\sqrt{\sin\theta}}\times\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta=\pi$. 7

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