BTS-III(S)-05.17-0718 Reg. No. | | | | | | | | |

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B.Tech. Degree III Semester Supplementary Examination May 2017

IT/CS/EC/CE/EE/ME/SE

AS 15-1301 LINEAR ALGEBRA AND TRANSFORM TECHNIQUES

(2015 Scheme)

Time : 3 Hours Maximum Marks : 60

PART A

(Answer *ALL* questions)

$(10 \times 2 = 20)$

I. (a) Find the values of l and m such that the rank of the matrix $\begin{bmatrix} 2 & 1 & -1 & 3 \\ 1 & -1 & 2 & 4 \\ 7 & -1 & l & m \end{bmatrix}$ is 2.

(b) Find the value of λ for which the system of equation $x+2y=0;\ 2x+\lambda y=0$ has (i) unique solution and (ii) more than one solution.

(c) Find the eigen values and eigen vectors of $A=\begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

(d) Explain linearly independent and dependent vectors with examples.

(e) Define basis and dimension of a vector space with example.

(f) Find the Fourier series to represent $x-\pi$ in the interval $(-\pi, \pi)$.

(g) Obtain the half range sine series of the function $f(x)=kx(x-l)$ in $0 \le x \le l$.

(h) Find the Laplace transform of $t\sin 2t$.

(i) Find the Laplace transform of $\dfrac{1-e^t}{t}$.

(j) Find the inverse Laplace transform of $\log\left[\dfrac{1+s}{s^2}\right]$.

PART B

$(4 \times 10 = 40)$

II. (a) Diagonalize the matrix $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$.

(b) Reduce the quadratic form $2xy+2yz+2zx$ into canonical form.

OR

III. (a) Test for consistency and solve the following;
$2xy-y-z=2;\ x+2y+z=2;\ 4x-7y-5z=2.$

(b) Verify Cayley Hamilton theorem for the matrix $A=\begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$.

(P.T.O.)

IV. (a) Explain inner product and inner product space with examples.

(b) Explain orthogonal and orthonormal basis in an inner product space with examples.

OR

V. (a) Explain Gram Schimidt orthogonalization process.

(b) Find k so that $u=(1, 2, k, 3)$ and $v=(3, k, 7, -5)$ in R^4 are orthogonal.

VI. (a) Find the Fourier series expansion of period $2l$ for the function $f(x)=(l-x)^2$ in the range $(0, 2l)$.

(b) Using Fourier sine integral for $f(x)=e^{-ax}(a>0)$ show that $\int_0^{\alpha}\frac{\lambda\sin\lambda x}{\lambda^2+a^2}d\lambda=\frac{\pi}{2}e^{-ax}$.

OR

VII. (a) Find the Fourier cosine integral of the function e^{-ax} and hence deduce the value of the integral $\int_0^{\alpha}\frac{\cos\lambda x}{1+\lambda^2}d\lambda$.

(b) Find the Fourier transform of $f(x)=\begin{cases}1 & \text{in } |x|<a \\ 0 & \text{in } |x|>a\end{cases}$.

VIII. (a) Using convolution theorem find $L^{-1}\left[\frac{1}{S(S^2+1)}\right]$.

(b) Using Laplace transfer solve $y''-3y'+2y=e^{2t}$, $y(0)=-3$, $y'(0)=5$.

OR

IX. (a) Using Laplace transform solve the integral equation $\frac{dy}{dt}+4y+5\int_0^t y\,dt=e^{-t}$, when $y(0)=0$.

(b) Use Laplace transform to evaluate $\int_0^{\infty}t\,e^{-2t}\sin t\,dt$.

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