SYBSCIT Sem III Reg & A.T.K.T. Exam Oct-2022

S.Y.B.Sc.(IT) SEM-III

10/10/22

APPLIED MATHEMATICS

Duration:2 hours & 30 Minutes **Total Marks :75**

NOTE:

(i) All the questions are compulsory.

(ii) All the questions carry equal marks.

(iii) Simple calculator is allowed.

Q-1 Attempt Any Three: **[15]**

[1] Verify Cayley- Hamilton Theorem for the matrix A. Given that;

$$A=\begin{bmatrix}1 & 2 & -2\\ -1 & 3 & 0\\ 0 & -2 & 1\end{bmatrix};\ A^2=\begin{bmatrix}-1 & 12 & -4\\ -4 & 7 & 2\\ 2 & -8 & 1\end{bmatrix};\ A^3=\begin{bmatrix}-13 & 42 & -2\\ -11 & 9 & 10\\ -10 & -22 & -3\end{bmatrix}$$

[2] Find Eigen Value of the matrix $A=\begin{bmatrix}2 & 2 & 1\\ 1 & 3 & 1\\ 1 & 2 & 2\end{bmatrix}$

[3]P.T. the following matrix is orthogonal and hence find A^{-1}.

$$A=\frac{1}{3}\begin{bmatrix}-2 & 1 & 2\\ 2 & 2 & 1\\ 1 & -2 & 2\end{bmatrix}$$

[4] Find the Modulus and argument of: (a) 1+ i (b) 1-$\sqrt{3}$i

[5] Write in the form of r $(\cos\theta + i\sin\theta)$: (i) -1 + i $\sqrt{3}$ (ii) $\sqrt{3} + i$

[6] Do as directed:

(i)Write $\frac{3+2i}{2-3i}$ in standard form x + iy.

(ii)Write $e^{i\theta}$ in the polar form.

(iii)Write the De Moivre's Theorem.

Q-2 Attempt Any Three: **[15]**

[1]Solve: $(x+1)\frac{dy}{dx}=x(y^2+1)$

[2] Solve: $(xy^2+x)dx+(yx^2+y)dy=0$

[3] Solve: $(5x^4+3x^2y^2-2xy^3)dx+(2x^3y-3x^2y^2-5y^4)dy=0$

[4] Solve; $(y^2-x^2)dx+2xydy=0$

[5] Write the order and Degree of the following differential equations:

(i) $\frac{d^2y}{dx^2}+ax^3=0$ (ii) $x^2\left(\frac{d^2y}{dx^2}\right)^2+y\left(\frac{dy}{dx}\right)^3+y^3=0$

[6] Solve: $(D^2+4)y=cos2x$

Q-3 Attempt Any Three: **[15]**

[1]Find $L^{-1}\left[\frac{2}{s}+\frac{1}{s^2}+\frac{s}{s^2-9}\right]$

[2] Find $L^{-1}\left(\frac{s}{s^2-16}\right)$

[3] Find $L^{-1}\left[\frac{1}{s(s+a)}\right]$by using convolution theorem.

[4] Find $L[4t^2+\sin 5t+e^{3t}]$

[5] Find $L[e^{-3t}\cos 4t]$

[6] Find the Laplace/inverse Laplace transform of the following:

1. L (1) 2. L [cos x] 3. $L^{-1}\left(\frac{1}{s^4}\right)$ 4. $L^{-1}\left(\frac{1}{s+2}\right)$ 5. $L^{-1}\left(\frac{1}{s^2+2}\right)$

Q-4 Attempt Any Three: **[15]**

[1] Evaluate: $\int_0^3\int_0^1 (x^2+3y^2)dydx$

[2] $P.T.\int_1^a\int_1^b \frac{1}{xy}dydx = (\log a)(\log b)$

[3] Evaluate: $\int_1^2\int_1^3 xy^2\,dxdy$

[4] Evaluate: $\int_0^1\int_0^2\int_1^2 x^2yz\,dzdydx$

[5] Evaluate: $\int_{-3}^3\int_0^1\int_1^2 (x+y+z)\,dxdydz$

[6] Evaluate: $\int_0^1\int_{y^2}^1\int_0^{1-x} x\,dzdydx$

Q-5 Attempt Any Three: **[15]**

[1] P.T. $\beta(m,n) = \beta(m,n+1)+\beta(m,n+1)$

[2] Evaluate $\int_0^\infty t^{\frac{3}{2}}e^{-t}dt$

[3] Evaluate: $\int_0^{\frac{\pi}{2}} sin^4\theta d\theta$

[4] Evaluate $\int_0^1 x^{\frac{3}{2}}(1-x)^{-\frac{5}{2}}dt$

[5] Evaluate $\int_0^{\frac{\pi}{2}} sin^3\,\theta cos^8\theta d\theta$

[6] Evaluate: $\int_0^{\frac{\pi}{2}} cos^3\theta d\theta$

X.....X.....X.....X