Sub Code: AHT-301	ROLL NO.

Model Question Paper

COURSE: M.TECH.	**BRANCH**: POWER SYSTEMS
SEMESTER: 1	**SUBJECT**: ADVANCED MATHEMATICS
Duration: 3:00 hrs	**Max marks: 100**

Note: Attempt all questions.

1. Attempt any four parts of the following: 5x4 =20

A. The eigen vectors of a 3×3 real symmetric matrix A corresponding to the eigen values $2\,,3\,,6$ are $[1 \quad 0 \quad -1]^T$, $[1 \quad 1 \quad 1]^T$ *and* $[-1 \quad 2 \quad -1]^T$ respectively. Find the matrix A.

B. Solve the following equations by Gauss-Jordan method

$$10x + y + z = 12\,,\; x + 10y + z = 12 \;and\; x + y + 10\,z = 12$$

C. Using Relaxation method solve the system of equations: $9x - 2y + z = 50$, $x + 5y - 3z = 18$ and $-2x + 2y + 7z = 19$.

D. Determine the largest eigen value and the corresponding eigen vector of the matrix $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$

E. Using the iterative method, find the inverse of $A = \begin{bmatrix} 1 & 10 & 1 \\ 2 & 0 & 1 \\ 3 & 3 & 2 \end{bmatrix}$ taking $B = \begin{bmatrix} 0.4 & 2.4 & -1.4 \\ 0.14 & 0.14 & -0.14 \\ -0.85 & -3.8 & 2.8 \end{bmatrix}$

2. Attempt any four parts of the following. 5x4=20

A. Find a complete integral of $pz = 1 + q^2$

B. Find a complete integral of $z^2\,(p^2 + q^2) = x^2 + y^2$

C. Solve $\frac{\partial^3 z}{\partial x^2 \partial y} - 2\,\frac{\partial^3 z}{\partial x \partial y^2} + \frac{\partial^3 z}{\partial y^3} = \frac{1}{x^2}$

D. If a string of length l is initially at rest in equilibrium position and each of its point is given the velocity $\left(\frac{\partial y}{\partial t}\right)_{t=0} = b\, sin^3 \frac{\pi x}{l}$, find the displacement $y(x,t)$.

E. A rectangular plate with insulated surface is $10cm$ wide and so lomg compared to its width that it may be considered as infinite in length without introducing an appreciable error. If the temperature of the short edge $y = 0$ is given by $u = 20x$ for $0 \le x \le 5$ and $u = 20(10 - x)$ for $5 \le x \le 10$ and the two long edges $x = 0\,, x = 10$ as well as the other short edge are kept at $0^0 C$, find the temperature u at any point $(x\,,y)$.

3. Attempt any two parts of the following. 10x2=20

A. Given that $I = Q = 0$ at $t = 0$, using Laplace transform, find I in the LR circuit for $t > 0$ where E is the voltage (potential difference) and given by $E = E_0 sinwt$.

B. Using Fourier transformation solve $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$, $0 < x < \pi$ subject to the conditions $u(x\,,0) = e^{-x}$, $0 < x < \pi$, $u(\,0\,,t) = 0$, $u(\pi\,,t) = 0$, $t \geq 0$.

C. Find the Fourier transform of the function $f(x) = \begin{cases} 1 - x^2 & |x| < 1 \\ 0 & |x| > 1 \end{cases}$ hence evaluate $\int_0^\infty \frac{xcosx - sinx}{x^3} cos\frac{x}{2}dx$

4. Attempt any two parts of the following. 10x2=20

A. Find the Z- transform of $c^k sin\alpha k$, $k \geq 0$

B. Solve $y_{k+2} - \frac{5}{6}y_{k+1} + \frac{1}{6}y_k = 3^k$, $y_0 = 0$, $y_1 = 1$ using Z-transform method.

C. Using convolution theorem find the inverse Z-transform of $\frac{z.(z+1)}{(z-1)^3}$.

5. Attempt any two parts of the following. 10x2=20

A. Define negative binomial distribution and show that Poisson distribution is a limiting case of the negative binomial distribution.

B. Find the moment generating function of the continuous normal distribution given by $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$, $-\infty < x < \infty$ and find its mean and variance.

C. Find the mean , variance and the coefficients β_1 ,β_2 of the distribution

$dF = kx^2 e^{-x} dx$, $0 < x < \infty$