SRM VALLIAMMAI ENGEINEERING COLLEGE

SRM Nagar, Kattankulathur – 603 203.

(An Autonomous Institution)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

QUESTION BANK

I SEMESTER

1918106 – APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

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SRM VALLIAMMAI ENGEINEERING COLLEGE

QUESTION BANK

DEPARTMENT OF MATHEMATICS

SUBJECT : 1918106 – APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

SEM / YEAR : I / I year M.E. (PSE & CI)

UNIT I -MATRIX THEORY- Cholesky decomposition - Generalized Eigen vectors, Canonical basis - QR factorization - Least squares method - Singular value decomposition.			
Q.No.	**Question**	**Bloom's Taxonomy Level**	**Domain**
	PART – A		
1.	Define Hermitian Matrix.	**BTL -1**	Remembering
2.	Write the necessary conditions for Cholesky decomposition of a matrix.	**BTL -1**	Remembering
3.	Find the Cholesky decomposition of $\begin{pmatrix} 4 & 2 \\ 2 & 10 \end{pmatrix}$	**BTL -2**	Understanding
4.	Find the sum and product of all Eigen values of $\begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	**BTL -2**	Understanding
5.	Define Least square method.	**BTL -1**	Remembering
6.	Find the least square solution to the system $x_1 + x_2 = 3$, $-2x_1 + 3x_2 = 1$ *and* $2x_1 - x_2 = 2$	**BTL -2**	Understanding
7.	Write down the stable formula for generalized inverse.	**BTL -1**	Remembering
8.	Write short note on Singular value decomposition of complex matrix A.	**BTL -1**	Remembering
9.	State Singular value decomposition theorem.	**BTL -1**	Remembering
10.	If A is a nonsingular matrix, then what is A^+?	**BTL -4**	Analyzing
11.	Define orthogonal and orthonormal vectors.	**BTL -1**	Remembering
12.	Write short note on Gram Schmidt Orthonormalisation process.	**BTL -1**	Remembering
13.	What is the advantage in matrix factorization methods?	**BTL -1**	Remembering
14.	Describe QR algorithm.	**BTL -1**	Remembering

15.	Let $\boldsymbol{A} = \begin{pmatrix} 1 & 1 \\ 1 & 3 \end{pmatrix} = \boldsymbol{A_1}$ .Compute A_2 using QR algorithm.	**BTL -5**	Evaluating
16.	Determine the canonical basis for the matrix A = $\begin{bmatrix} 3 & 5 \\ -2 & -4 \end{bmatrix}$.	**BTL -3**	Applying
17.	Define the generalized Eigen vector, chain of rank m, for a square matrix.	**BTL -2**	Understanding
18.	Find the generalized inverse of $\begin{bmatrix} 1 & 1 \\ 0 & 1 \\ 1 & 0 \end{bmatrix}$	**BTL -5**	Evaluating
19.	Check whether the given matrix is positive definite or not $\begin{pmatrix} 3 & 1 & -1 \\ 1 & 3 & -1 \\ -1 & -1 & 5 \end{pmatrix}$	**BTL -4**	Analyzing
20.	Give the nature of quadratic form whose matrix is $\begin{pmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -2 \end{pmatrix}$	**BTL -4**	Analyzing
PART – B			
1.	Determine the Cholesky decomposition of the matrix $\begin{bmatrix} 4 & 2i & -i \\ -2i & 10 & 1 \\ i & 1 & 9 \end{bmatrix}$	**BTL -1**	Remembering
2.	Find the Cholesky decomposition of the matrix $\begin{bmatrix} 4 & 2i & 2 \\ -2i & 10 & 1-i \\ 2 & 1+i & 9 \end{bmatrix}$	**BTL -2**	Understanding
3.	Find the QR factorization of A = $\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix}$	**BTL -2**	Understanding
4.	Solve the following system of equations in the least square sense $2x_1 + 2x_2 - 2x_3 = 1, 2x_1 + 2x_2 - 2x_3 = 3, -2x_1 - 2x_2 + 6x_3 = 2$	**BTL -5**	Evaluating
5.	Determine the Cholesky decomposition of $\begin{bmatrix} 9 & -3 & 0 & -3 \\ -3 & 6 & 3 & 0 \\ 0 & 6 & 3 & 0 \\ -3 & 0 & -3 & 6 \end{bmatrix}$	**BTL -3**	Applying
6.	Fit a straight line in the least square sense to the following data **X:** **-3** **-2** **-1** **0** **1** **2** **3** **Y:** **10** **15** **19** **27** **28** **34** **42**	**BTL -6**	Creating
7.	Find the QR factorization of A = $\begin{bmatrix} 1 & 1 & -1 \\ 1 & 0 & 0 \\ 1 & 0 & -2 \\ 1 & 1 & 1 \end{bmatrix}$	**BTL -4**	Analyzing
8.	Construct the singular value decomposition for $\begin{bmatrix} 2 & 2 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 6 \end{bmatrix}$	**BTL -6**	Creating
9.	Solve the following system of equations in the least square sense $x_1 + x_2 + 3x_3 = 1$; $x_1 + x_2 + 3x_3 = 2$	**BTL -5**	Evaluating

10.	Obtain the singular value decomposition of A = $\begin{bmatrix} 1 & 2 \\ 1 & 1 \\ 1 & 3 \end{bmatrix}$	**BTL -2**	Understanding
11.	Determine the Cholesky decomposition of the matrix $\begin{bmatrix} 16 & -3 & 5 & -8 \\ -3 & 16 & -5 & -8 \\ 5 & -5 & 24 & 0 \\ 8 & -8 & 0 & 21 \end{bmatrix}$	**BTL -3**	Applying
12.	Obtain the singular value decomposition of $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 1 & 3 \end{bmatrix}$	**BTL -3**	Applying
13.	Find the QR factorization of A = $\begin{bmatrix} 1 & 1 & -1 \\ 1 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$	**BTL -1**	Remembering
14.	Solve the following system of equations in the least square sense **$x_1 + x_2 + x_3 = 1$; $x_1 + x_2 + x_3 = 2$; $x_1 + x_2 + x_3 = 3$.**	**BTL -5**	Evaluating
	PART –C		
15.	Solve the system of equations using Cholesky decomposition $4x_1 - x_2 - x_3 = 3$; $-x_1 + 4x_2 - x_3 = -0.5$; $-x_1 - 3x_2 + 5x_3 = 0$	**BTL -5**	Evaluating
16.	Obtain the singular value decomposition of A=$\begin{bmatrix} 2 & -1 \\ -2 & 1 \\ 4 & -2 \end{bmatrix}$	**BTL -2**	Understanding
17.	Obtain $A^{+}$of A=$\begin{bmatrix} 2 & -1 \\ -1 & 1 \\ 4 & -3 \end{bmatrix}$the generalized inverse.	**BTL -2**	Understanding
18.	Find the Unique solution of least square problem A = $\begin{bmatrix} 2 & -2 \\ 1 & 1 \\ 2 & 2 \end{bmatrix}$ $b = \begin{bmatrix} 500 \\ 600 \\ 900 \end{bmatrix}$	**BTL -6**	Creating

UNIT –II-CALCULUS OF VARIATION : Concept of variation and its properties–Euler's equation–Functional dependant on first and higher order derivatives–Functionals dependant on functions of several independent variables–Variational problems with moving boundaries–Isoperimetric problems-Direct methods : Ritz and Kantorovich methods.

Q.No.	**Question**	**Bloom's Taxonomy Level**	**Domain**
	PART – A		
1.	Define functional and extremal.	**BTL -1**	Remembering
2.	Write Euler's equation for functional	**BTL -1**	Remembering
3.	State the necessary condition for the extremum of the functional	**BTL -2**	Understanding

	I = $\int_{x_0}^{x_1} F(x, y, y')\, dx$.		
4.	Find the extremals of the functional $\int_{x_0}^{x_1} \left(\frac{y'^2}{x^3}\right) dx$.	**BTL -3**	Applying
5.	Write a formula for functional involving higher order derivatives.	**BTL -1**	Remembering
6.	Solve the Euler equation for $\int_{x_0}^{x_1} (1+x^2 y')y'\,dx$	**BTL -5**	Evaluating
7.	Solve the Euler equation for $\int_{x_0}^{x_1} (x+y')y'\,dx$	**BTL -5**	Evaluating
8.	Write other forms of Euler's equation.	**BTL -2**	Understanding
9.	Find the curve on which the functional straight line $\int_{x_0}^{x_1} [(y')^2 + 12xy]\,dx$ with y(0) = 0 and y(1) = 1can be extremised.	**BTL -6**	Creating
10.	Write Euler-Poisson equation.	**BTL -2**	Understanding
11.	Write the ostrogradsky equation for the functional $\iint F(x, y, u, u_x, u_y)\,dxdy$.	**BTL -2**	Understanding
12.	Define moving boundaries.	**BTL -1**	Remembering
13.	Define Geodesic.	**BTL -1**	Remembering
14.	Define isoperimetric problems	**BTL -1**	Remembering
15.	Define several independent variables.	**BTL -1**	Remembering
16.	Write short note on Rayleigh - Ritz method.	**BTL -2**	Understanding
17.	State Brachistochrone problem.	**BTL -2**	Understanding
18.	Which method is to be applied for solving isoperimetric problems?	**BTL -4**	Analyzing
19.	Write the ostrogradsky equation for the functional I[u(x,y)]=$\iint [(u_x)2 + (u_y)2]\,dxdy$.	**BTL -2**	Understanding
20.	Write a short note on Kantorovich method.	**BTL -2**	Understanding
	PART –B		
1.(a)	Find the extremals of (i) $\int_{x0}^{x1} (y^{1^2} + 2yy^1 - 16y^2)\,dx$.	**BTL -3**	Applying

1. (b)	Find the extremals of $\int_0^{\frac{\pi}{2}}[y^2+(y')^2-2y\sin x]dx$ y(0) = y(π/2) = 0.	**BTL -3**	Applying
2. (a)	Solve the extremals $\boldsymbol{v[y(x)] = \int_{x0}^{x1}\frac{dy}{dx}\left(1+x^2\frac{dy}{dx}\right)dx}$.	**BTL -5**	Evaluating
2.(b)	Find the extremals of $\int_0^{\frac{\pi}{2}}[y^2-(y')^2-2y\sin x]dx$ y(0) = y(π/2) = 0.	**BTL -3**	Applying
3. (a)	Show that the straight line is the shortest distance between two points.	**BTL -2**	Understanding
3.(b)	Find the extremals of $\boldsymbol{\int_{x_0}^{x_1}(y^2+y^{1^2}-2ye^x)dx}$	**BTL -2**	Understanding
4.	A curve c joining the points $\boldsymbol{(x_1, y_1)}$ and $\boldsymbol{(x_2, y_2)}$ is revolved about the x-axis. Find the shape of the curve, so that the surface area generated is a minimum.	**BTL -4**	Analyzing
5. (a)	Find the extremals of $\int_0^{\pi}[y'^2-y^2+4y\cos x]dx$ y(0) = y(π) = 0.	**BTL -3**	Applying
5.(b)	On what curve the functional $\int_0^{\frac{\pi}{2}}[y'^2-y^2+2xy]dx\ with\ y(0)=0\ y(\frac{\pi}{2})=0$ be extremised.	**BTL -2**	Understanding
6. (a)	Show that the curve which extremize $\boldsymbol{I=\int_0^{\frac{\pi}{2}}[(y^{11})^2-y^2+x^2]dx}$ given that $\boldsymbol{y(0)=0, y^1(0)=1, y\left(\frac{\pi}{4}\right)=\frac{1}{\sqrt{2}}, y^1\left(\frac{\pi}{4}\right)=\frac{1}{\sqrt{2}}\ is\ y=\sin x}$.	**BTL -2**	Understanding
6.(b)	Find the curves on which the functionals $\int_0^1[y'^2+12yx]dx$ with y(0) = 0 , y(1)=1 can be extremised.	**BTL -4**	Analyzing
7. (a)	Determine the extremals of the functional $\boldsymbol{I[y(x)]=\int_{-a}^{a}\left\{\frac{1}{2}\mu(y^{11})^2+\rho y\right\}dx}$ that satisfies the boundary condition $\boldsymbol{y(-a)=0, y(a)=0, y^1(-a)=0, y^1(a)=0}$.	**BTL -3**	Applying
7. (b)	Find the extremals of $\int_{x_0}^{x_1}[y^2+(y')^2+2ye^x]dx$	**BTL -3**	Applying
8. (a)	Solve the boundary value problem y” + y +x = 0 (0 ≤ x ≤ 1) y(0) = y(1) = 0 byRayleigh Ritz method.	**BTL -5**	Evaluating
8.(b)	Show that the functional $\int_0^{\frac{\pi}{2}}[2xy+\left(\frac{dx}{dt}\right)^2+\left(\frac{dy}{dt}\right)^2]dt$ such that	**BTL -5**	Evaluating

	x(0) = 0 x(π/2) = -1 y(0) = 0 , y(π/2) = 1 is stationary for x = - sin t y = sin t.		
9.	Find the curve on which an extremum of the function $I = \int_0^{\frac{\pi}{4}} \left\{ y^2 - \left(\frac{dy}{dx}\right)^2 \right\} dx, y(0) = 0$ can be achieved if the second boundary point is permitted to move along the straight line $x = \frac{\pi}{4}$.	**BTL -4**	Analyzing
10.	Solve the boundary value problem by Rayleigh Ritz method. $y^{11} - y + x = 0 \ (0 \le x \le 1) \ y(0) = y(1) = 0$	**BTL -5**	Evaluating
11.(a)	Find the curve connecting the points such that a particle sliding down this curve under gravity from one point to another reaches in the shortest time.	**BTL -4**	Analyzing
11.(b)	Find the extremals of $A = \int \frac{1}{2}[xy' + y x']dt$ subject to a constant integral $\int_{t1}^{t2} \sqrt{(x'^2 + y'^2)}\ dt = 1$	**BTL -5**	Evaluating
12.	Solve the problem y" = 3x+4y, y(0) = 0 , y(1) = 1 by Rayleigh Ritz method.	**BTL -5**	Evaluating
13.(a)	Find an approximate solution to the problem of minimum of the functional $J(y) = \int_0^1 (y'^2 - y^2 + 2xy) dx, y(0) = 0 = y(1)$ by Ritz method.	**BTL - 3**	Applying
13.(b)	Find the extremals of isoperimetric problem $\int_{x0}^{x1} y'^2 dx$ given that $\int_{x0}^{x1} y\, dx = c$ a constant.	**BTL -3**	Applying
14.	Find the extremals of $\int_{x0}^{x1} [2yz - 2y^2 + y^2 - z'^2]dx$.	**BTL -3**	Applying
	PART – C		
15.	Prove that the sphere is the solid figure of a revolution which for a given surface has maximum volume.	**BTL -2**	Understanding
16.	Solve problem y" + (1+x^2)y +1 =0 by Rayleigh Ritz method if y(-1) = y(1) = 0.	**BTL -5**	Evaluating
17.	Find the extremals of $\int_1^2 \frac{\sqrt{(1+y'^2)}}{x}$ y(1) = 0, y(2) = 1.	**BTL -3**	Applying
18.	Find the extremals of the functional $v[y(x), z(x)] = \int_0^{\frac{1}{2}\pi} \left(y^{1^2} + z^{1^2} + 2yz \right) dx$ *given that* $y(0) = 0$, $y\left(\frac{1}{2}\pi\right) = -1$, z(0)=0, $z\left(\frac{1}{2}\pi\right) = 1$.	**BTL -3**	Applying

UNIT – III PROBABILITY AND RANDOM VARIABLES: Probability–Axioms of probability–Conditional probability–Baye's theorem-Random variables-Probability function–Moments–Moment generating functions and their properties–Binomial,Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions–Function of a random variable.

Q.No.	Question	Bloom's Taxonomy Level	Domain
PART – A			
1.	Define conditional probability.	**BTL -1**	Remembering
2.	If X is aCRV with p.d.f. f(x) =2x ,0 <x< 1 , then find the pdf of the RV $Y = 8X^3$	**BTL -2**	Understanding
3.	If the mean of a Poisson variate is 2, then what is the standard deviation?	**BTL -2**	Understanding
4.	If X and Y are independent RVs with variances 2 and 3 .Find the variance of 3X + 4Y.	**BTL -2**	Understanding
5.	What is the use of Bayes' theorem?	**BTL -6**	Creating
6.	Define uniform distribution.	**BTL -3**	Applying
7.	The mean variances of binomial distribution are 4 and 3 respectively. Find P(X=0).	**BTL -3**	Applying
8.	Find the moment generating function of Poisson distribution.	**BTL -3**	Applying
9.	The probability that a man shooting a target is ¼. How many times must he fire so that the probability of his hitting the target at least once is more than 2/3.	**BTL -2**	Understanding
10.	Obtain the moment generating function of Geometric distribution.	**BTL -1**	Remembering
11.	If 3% of the electric bulb s manufactured by a company are defective, find the probability that in a sample of 100 bulbs exactly 5 bulbs are defective.	**BTL -4**	Analyzing
12.	If the RV X takes the values 1 ,2,3 , 4 such that 2P(X = 1)=3P(X =2) =P (X =3) = 5 P (X =4) find the probability distribution.	**BTL -4**	Analyzing
13.	State the memoryless property of an exponential distribution.	**BTL -1**	Remembering
14.	If a RV has the pdf $f(x) = \begin{cases} 2e^{-2x} & for\ x > 0 \\ 0, & for\ x \leq 0 \end{cases}$, find the mean	**BTL -5**	Evaluating

	variance of RV X.		
15.	The first four moments of a distribution about 4 are 1 ,4,10 and 45 respectively. Show that the mean is 5 and variance is 3.	**BTL -4**	Analyzing
16.	$If\ f(x) = \begin{cases} kx^2 & ,0 < x < 3 \\ 0, otherwise \end{cases}$ Find the value of X ,then find the value of K.	**BTL -5**	Evaluating
17.	If the probability is 0.05 that a certain kind of measuring device will show excessive drift , what is the probability that the sixth measuring device tested will be the first to show excessive drift?	**BTL -5**	Evaluating
18.	If a RV has the probability density $(x) = \begin{cases} 2e^{-2x} & for\ x > 0 \\ 0, for\ x \leq 0 \end{cases}$, find the probabilities that will take a value between 1 and 3.	**BTL -4**	Analyzing
19.	A Random Variable X has the p.d.f. $f(x) = \begin{cases} xe^{-x} & for\ x > 0 \\ 0, for\ x \leq 0 \end{cases}$ Find the CDF of X.	**BTL -4**	Analyzing
20.	Write two characteristics of the Normal Distribution.	**BTL -1**	Remembering
	PART –B		
1.(a)	In a bolt factory machines A, B, C manufacture respectively 25%, 35% and 40% of the total of their output 5, 4, 2 percent are defective bolts. If A bolt is drawn at random from the product and is found to be defective, what are the probabilities that is was manufactured by machines A, B and C?	**BTL -6**	Creating
1. (b)	Derive the MGF of Poisson distribution and hence deduce its mean and variance.	**BTL -1**	Remembering
2. (a)	A manufacturer of certain product knows that 5 % of his product is defective .If he sells his product in boxes of 100 and guarantees hat not more than 10 will be defective ,what is the approximate probability that a box will fail to meet the guaranteed quality?	**BTL -1**	Remembering
2.(b)	The probability density function of a random variable X is given	**BTL -4**	Analyzing

	by $f(x) = \begin{cases} x & 0 < x < 1 \\ k(2-x) & 1 \le x \le 2 \\ 0 & otherwise \end{cases}$ (i)Find the value of k (ii) P (0.2<x<1.2) (iii) What is P[0.5 < x < 1.5/x ≥1 (iv) Find the distribution function of f(x).		
3. (a)	If X is a discrete random variable with probability function $p(x) = \frac{1}{K^x}$, x =1,2 ... (K constant) then find the moment generating function ,mean and variance.	**BTL -3**	Applying
3.(b)	Find the MGF, mean and variance of the Gamma distribution**.**	**BTL -1**	Remembering
4. (a)	In 100 sets often tosses of an unbiased coin, in how many cases should be expect (i) 7 heads and 3 tails, (ii) atleast 7 heads.	**BTL -3**	Applying
4.(b)	The number of monthly breakdown of a computer is a random variable having a poisson distribution with mean equal to 1.8. Find the probability that this computer will function for a month (i)Without breakdown(ii) With only one breakdown and(iii)With atleast one breakdown.	**BTL -4**	Analyzing
5. (a)	Let the random variable X has the p.d.f. $f(x) = \begin{cases} \frac{1}{2}e^{-\frac{x}{2}}, x > 0 \\ 0 . otherwise \end{cases}$ Find the mean and variance.	**BTL -3**	Applying
5.(b)	Out of 800 families with 4 children each , how many would you expect to have i) at least 1 boy ii) 2 boys iii) 1 or 2 girls iv) no girls.	**BTL -4**	Analyzing
6. (a)	In a normal distribution, 31 % of the items are under 45, 8% are over 64.Find the mean and variance of the distribution	**BTL -2**	Understanding
6.(b)	Let X be a continuous random variable with p.d.f $f(x) = \begin{cases} ax , & 0 \le x \le 1 \\ a , & 1 \le x \le 2 \\ -ax + 3a, & 2 \le x < 3 \\ 0, & otherwise \end{cases}$ (i)Find a, (ii) Compute $P(X \le 1.5)$ (iii) Find the c.d.f of X.	**BTL -3**	Applying

7. (a)	If X is Uniformly distributed in (0 ,10) ,find probability (i) X < 2 (ii)X > 8 (iii) 3 <X <9?	**BTL -4**	Analyzing
7. (b)	A wireless set is manufactured with 25 soldered joints. On average one in 500 is defective.How many sets can be expected to be free from defective joints in a consignment of 10,000 sets?	**BTL -4**	Analyzing
8. (a)	A discrete RV X has the probability function given below X : 0 1 2 3 4 5 6 7 P(x) : 0 a 2a 2a 3a a^2 $2a^2$ $7a^2 + a$ Find (i) Value of a (ii) p (X <6) , P (X ≥ 6) , P (0 < X < 4) (iii) Distribution function.	**BTL -3**	Applying
8.(b)	Find the MGF , mean and variance of the Exponential distribution	**BTL -1**	Remembering
9. (a)	The slum clearance authorities in a city installed 2000 electric lamps in a newly constructed township. If the lamps have an average life of 1000 hours with a std deviation of 200 hrs ,what number of lamps might be expected to fail in the first 700 burning hours? After what period of burning hours would you expect 10 percent of the lamps would have been failed ? (Assume that the life of the lamps follows a normal law)	**BTL -4**	Analyzing
9.(b)	Find the MGF , mean and variance of the Uniform distribution.	**BTL -1**	Remembering
10.(a)	The daily consumption of milk in a city ,in excess of 20,000 gallons ,in approximately distributed as a Gamma variate with the parameters k = 2 and $\lambda = \frac{1}{10,000}$.The city has adaily stock of 30,000 gallons. What is the probability that the stock is insufficient on a particular day?	**BTL -3**	Applying
10.(b)	Find the MGF , mean and variance of the Binomial distribution.	**BTL -1**	Remembering
11.(a)	Find the first four moments about the origin $f(x)=\begin{cases} \frac{4x(9-x^2)}{81} & 0 \le x \le 3 \\ 0 & otherwise \end{cases}$	**BTL -5**	Evaluating
11.(b)	The number of hardware failures of a computer system ina week of operations has the following P.d.f, Deduce P(X<5 / X>1), K. <table><tr><td>No.of failures</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>Probability</td><td>K</td><td>2 K</td><td>2 K</td><td>K</td><td>3 K</td><td>K</td><td>4 K</td></tr></table>	**BTL -3**	Applying
12.(a)	A continuous random variable X that can assume any value between X = 2 and X =5 has a probability density function given by f(x) = k (1+x). Calculate P(X<4).	**BTL -3**	Applying
12.(b)	In a certain city , the daily consumption of electric power in	**BTL -4**	Analyzing

	millions of kilowatt hrs can be treated as a RV having Gamma distribution with parameters $\lambda = \frac{1}{3}$ and k = 4.If the power plant of this city has a daily capacity of 12 million kilowatt – hours, Write the probability that this power supply will be inadequate on any given day?		
13.(a)	If the probability mass function of a random variable X is given by $P[X = x] = kx^3, x = 1,2,3,4,$ Identify the value of k, $P[\left(\frac{1}{2} < X < \frac{5}{2}\right)/X > 1]$, mean and variance of X.	**BTL -3**	Applying
13.(b)	The marks obtained by a number of students for a certain subject is assumed to be normally distributed with mean 65 and standard deviation 5.If 3 students are taken at random from this set Interpret the probability that exactly 2 of them will have marks over 70?	**BTL -4**	Analyzing
14.(a)	Suppose the pdf of X is $f_x(x) = \begin{cases} 1, & 0 < x < 1 \\ 0, & otherwise \end{cases}$.. Determine the pdf of Y=aX+b, for a≠0.	**BTL -5**	Evaluating
14.(b)	VLSI chips , essential to the running condition of a computer system, fail in accordance with a Poisson distribution with the rate of one chip in about 5 weeks .if there are two spare chips on hand and if a new supply will arrive in 8 weeks .Evaluate the probability that during the next 8 weeks the system will be down for a week or more,owing to a lack of chips?	**BTL -3**	Applying
	Part - C		
15.	The input to a binary communication system, denoted by a random variable X, takes one of the two values 0 or 1with probabilities ¾ and ¼ respectively. Because of error caused by noise in the system, the output Y differs from the input occasionally. The behavior of the communication system is modeled by the conditional probabilities given below $P(Y = 1/x = 1) = 3/4$,$P(Y = 0/x = 0) = 7/8$ .Find i) P(Y=1) (ii)P(Y=0) iii) P(X=1/Y=1)	BTL -3	Applying
16.	An urn contains 10 white and 3 black balls. Two balls are drawn at random from the first urn and placed in the second and then 1ball is taken from the later .What is the probability that it is a	BTL -2	Understanding

	white ball?		
17.	A bag contains 5 balls and it is not known that how many of them are white. Two balls are drawn at random from the bag are noted to be white . What is the chance that all the balls in the bag are white	BTL -2	Understanding
18.	A dicrete RV X hass the following probability distribution. X: 0 1 2 3 4 5 6 7 8 P(x): a 3a 5a 7a 9a 11a 13a 15a 17a Find the value of a , Mean, variance P(X<3) ,P(X<5/X>3) and CDF of X.	BTL -1	Remembering

UNIT – IV LINEAR PROGRAMMING: Formulation–Graphical solution–Simplex method–Big M method-Two phase method-Transportation and Assignment models.

Q.No.	**Question**	**Bloom's Taxonomy Level**	**Domain**
	PART – A		
1.	What is degeneracy in a transportation model?	**BTL -1**	Remembering
2.	Differentiate between balanced and unbalanced cases in Assignment model	**BTL -2**	Understanding
3.	List any two basic differences between a transportation and assignment problem	**BTL -2**	Understanding
4.	What do you mean by degeneracy?	**BTL -1**	Remembering
5.	Explain optimal solution in L.P.P.	**BTL -1**	Remembering
6.	Solve the following L.P.P by using graphical method $\boldsymbol{Maximize\ Z = 3x_1 - 2x_2}$, Subject to $\boldsymbol{x_1 + x_2 \le 1, 3x_1 + 3x_2 \ge 6, x_1, x_2 \ge 0}$	**BTL -5**	Evaluating
7.	What is the difference between feasible solution and basic feasible solution?	**BTL -2**	Understanding
8.	Obtain an initial basic feasible solution to the following transportation problem by using Matrix Minima method D_1 D_2 D_3 D_4 capacity O_1 1 2 3 4 6	**BTL -3**	Applying

<table>
<tr><td></td><td>O_2 4 3 2 0 8
O_3 0 2 2 1 10
Demand 4 6 8 6</td><td></td><td></td></tr>
<tr><td>9.</td><td>What is an assignment problem? Give two applications.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>10.</td><td>Write down the mathematical formulation of L.P.P.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>11.</td><td>Enumerate the methods to find the initial basic feasible solution for transportation problem.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>12.</td><td>When will you say a transportation problem is said to be unbalanced?</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>13.</td><td>Write short note on North west corner rule.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>14.</td><td>What is a travelling sales man problem?</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>15.</td><td>Define transshipment problem.</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>16.</td><td>What is meant by Unbalanced Assignment Problem?</td><td>BTL -1</td><td>Remembering</td></tr>
<tr><td>17.</td><td>Explain Row, Column, minima methods to find initial solution of transportation problem .</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>18.</td><td>Solve by graphical method $Z = 5x_1 + 4x_2$, Subject to
$4x_1 + 5x_2 \le 10, 3x_1 + 2x_2 \le 9, 8x_1 + 3x_2 \le 12, x_1, x_2 \ge 0$</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>19.</td><td>Solve the assignment problem
<table><tr><td></td><td>P</td><td>Q</td><td>R</td><td>S</td></tr><tr><td>A</td><td>5</td><td>7</td><td>11</td><td>6</td></tr><tr><td>B</td><td>8</td><td>5</td><td>9</td><td>6</td></tr><tr><td>C</td><td>4</td><td>7</td><td>10</td><td>7</td></tr><tr><td>D</td><td>10</td><td>4</td><td>8</td><td>3</td></tr></table></td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>20.</td><td>Find the initial solution to the following TP using Vogel's approximation method
<table><tr><td></td><td>D_1</td><td>D_2</td><td>D_3</td><td>D_4</td><td>Supply</td></tr><tr><td>F_1</td><td>3</td><td>3</td><td>4</td><td>1</td><td>100</td></tr><tr><td>F_2</td><td>4</td><td>2</td><td>4</td><td>2</td><td>125</td></tr><tr><td>F_3</td><td>1</td><td>5</td><td>3</td><td>2</td><td>75</td></tr><tr><td>Demand</td><td>120</td><td>80</td><td>75</td><td>25</td><td>300</td></tr></table></td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td colspan="4">PART –B</td></tr>
<tr><td></td><td>Solve the L.P.P by Simplex method
$Maximize\ Z = 3x + 2y$ Subject to</td><td>BTL -2</td><td>Understanding</td></tr>
</table>

<table>
<tr><td>1.(a)</td><td>$2x + y \le 6 , x + 2y \le 6 , x , y \ge 0$</td><td></td><td></td></tr>
<tr><td>1. (b)</td><td>Solve the assignment problem
<table>
<tr><td></td><td>P</td><td>Q</td><td>R</td><td>S</td></tr>
<tr><td>A</td><td>18</td><td>26</td><td>17</td><td>11</td></tr>
<tr><td>B</td><td>13</td><td>28</td><td>14</td><td>26</td></tr>
<tr><td>C</td><td>38</td><td>19</td><td>18</td><td>15</td></tr>
<tr><td>D</td><td>19</td><td>26</td><td>24</td><td>10</td></tr>
</table></td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>2. (a)</td><td>Solve by Simplex method Maximize$Z = 5x_1 + 4x_2$, Subject to
$4x_1 + 10x_2 \le 10, 3x_1 + 2x_2 \le 9 , 8x_1 + 3x_2 \le 12, x_1 ,x_2 \ge 0$</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>2.(b)</td><td>Solve the following transportation problem:
<table>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>α_i</td></tr>
<tr><td>F_1</td><td>10</td><td>8</td><td>8</td><td>8</td></tr>
<tr><td>F_2</td><td>10</td><td>7</td><td>10</td><td>7</td></tr>
<tr><td>F_3</td><td>11</td><td>9</td><td>7</td><td>9</td></tr>
<tr><td>F_4</td><td>12</td><td>14</td><td>10</td><td>4</td></tr>
<tr><td>b_i</td><td>10</td><td>10</td><td>8</td><td></td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>3. (a)</td><td>Solve by Simplex method. Maximize $Z = 5x_1 + 3x_2$, Subject to
$5x_1 + 2x_2 \le 10, 3x_1 + 8x_2 \le 12 , x_1 + x_2 \le 2, x_1, x_2 \ge 0$.</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>3.(b)</td><td>Solve by Big M method Minimize $Z = 4x_1 + x_2$, Subject to
$3x_1 + x_2 = 3$; $4x_1 + 3x_2 \ge 6$; $x_1 + 2x_2 \le 3$ and $x_1, x_2, \ge 0$</td><td>BTL -4</td><td>Analying</td></tr>
<tr><td>4. (a)</td><td>Solve by Simplex method. Maximize $Z = 3x_1 + 2x_2$, Subject to
$4x_1 + 3x_2 \le 12, 4x_1 + x_2 \le 8 , 4x_1 - x_2 \le 8, x_1 ,x_2 \ge 0$.</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>4.(b)</td><td>Find the initial feasible solution for the following transportation problem
<table>
<tr><td></td><td>D1</td><td>D2</td><td>D3</td><td>D4</td><td>D5</td><td>Supply</td></tr>
<tr><td></td><td>3</td><td>2</td><td>3</td><td>4</td><td>1</td><td>100</td></tr>
<tr><td></td><td>4</td><td>1</td><td>2</td><td>4</td><td>2</td><td>125</td></tr>
<tr><td></td><td>1</td><td>0</td><td>5</td><td>3</td><td>2</td><td>75</td></tr>
<tr><td>Total</td><td>100</td><td>60</td><td>40</td><td>75</td><td>25</td><td></td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>5. (a)</td><td>Solve by Graphical method , Maximize $Z = 3x_1 + 4x_2$, Subject to $5x_1 + 4x_2 \le 200 , 3x_1 + 5x_2 \le 150 , 5x_1 + 4x_2 \ge 100,$
$8x_1 + 4x_2 \ge 80 \quad x_1 ,x_2 \ge 0$.</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>5.(b)</td><td>Solve by Big M method Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$ subject to $x_1 + 2x_2 + 3x_3 = 15$; $2x_1 + x_2 + 5x_3 = 20$; $x_1 + 2x_2 + x_3 + x_4 = 10$
$3x_1 + x_2 = 3$; $4x_1 + 3x_2 \ge 6$; $x_1 + 2x_2 \le 3$ and $x_1, x_2, \ge 0$</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>6. (a)</td><td>Solve by Graphical method Maxi$Z = 40x_1 + 30x_2$, Subject to
$3x_1 + x_2 \le 30,000$; $x_1 \le 8000$,; $x_2 \le 12,0000$,; $x_1 ,x_2 \ge 0$</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>6.(b)</td><td>Use two phase Simplex method solve the minimize</td><td>BTL -4</td><td>Analyzing</td></tr>
</table>

	$Z = 5x_1 - 6x_2 - 7x_3$, Subject to **$x_1 + 5x_2 - 3x_3 \geq 15$; $5x_1 - 6x_2 + 10x_3 \leq 20$; $x_1 + x_2 + x_3 = 5$ and $x_1, x_2, x_3 \geq 0$**		
7. (a)	Using Simplex method Maximize **$Z = x_1 + 2x_2 + 3x_3 - x_4$** , Subject to **$x_1 + 2x_2 + 3x_3 = 15$; $2x_1 + x_2 + 5x_3 = 20$; $x_1 + 2x_2 + x_3 + x_4 = 10$ and $x_1, x_2, x_3, x_4 \geq 0$**	**BTL -4**	Analyzing
7. (b)	Solve the assignment problem for optimal job assignment Job Machine $\begin{bmatrix} 10 & 3 & 3 & 2 & 8 \\ 9 & 7 & 8 & 2 & 7 \\ 7 & 5 & 6 & 2 & 4 \\ 3 & 5 & 8 & 2 & 4 \\ 9 & 10 & 9 & 6 & 10 \end{bmatrix}$	**BTL -3**	Applying
8.	Solve the assignment problem Job Machine $\begin{bmatrix} 13 & 8 & 16 & 18 & 19 \\ 9 & 15 & 24 & 9 & 12 \\ 12 & 9 & 4 & 4 & 4 \\ 6 & 12 & 10 & 8 & 13 \\ 15 & 17 & 18 & 12 & 20 \end{bmatrix}$	**BTL -4**	Analyzing
9. (a)	Solve by Simplex method Maximize **$Z = x_1 + x_2 + 3x_3$,** Subject to **$3x_1 + 2x_2 + x_3 \leq 2$; $2x_1 + x_2 + 2x_3 \leq 2$ and $x_1, x_2, x_3 \geq 0$**	**BTL -5**	Evaluating
9.(b)	Solve the transportation problem Supply $\begin{bmatrix} & 15 & 51 & 42 & 33 & 23 \\ & 80 & 42 & 26 & 81 & 44 \\ & 90 & 40 & 66 & 60 & 33 \\ Demand & 23 & 31 & 16 & 30 & 100 \end{bmatrix}$	**BTL -3**	Applying
10.	Solve by two phase Simplex method Max**$Z = 5x_1 - 4x_2 + 3x_3$,** **Subject to $2x_1 + x_2 - 6x_3 = 20$; $6x_1 + 5x_2 + 10x_3 \leq 76$; $8x_1 - 3x_2 + 6x_3 \leq 50$ and $x_1, x_2, x_3 \geq 0$**	**BTL -4**	Analyzing
11.	Solve by Simplex method Maximize **$Z = 4x_1 + 10x_2$, Subject to $2x_1 + x_2 \leq 10$; $2x_1 + 5x_2 \leq 20$ and $2x_1 + 3x_2 \leq 18$ and $x_1, x_2 \geq 0$**	**BTL -5**	Evaluating
12.	Find the assignment of machines to the job that will result in maximum profit. $\begin{matrix} 62 & 78 & 50 & 111 & 82 \\ 71 & 84 & 61 & 73 & 59 \\ 87 & 92 & 111 & 71 & 81 \\ 48 & 64 & 87 & 77 & 80 \end{matrix}$	**BTL -4**	Analyzing
13.(a)	Find the optimal solution of the transportation problem | | P | Q | R | S | Supply |	**BTL -4**	Analyzing

<table>
<tr><td></td><td>
<table>
<tr><td>A</td><td>6</td><td>3</td><td>5</td><td>4</td><td>22</td></tr>
<tr><td>B</td><td>5</td><td>9</td><td>2</td><td>7</td><td>15</td></tr>
<tr><td>C</td><td>5</td><td>7</td><td>8</td><td>6</td><td>8</td></tr>
</table>
Requirement 7 12 17 9</td><td></td><td></td></tr>
<tr><td>13.(b)</td><td>Solve by Simplex method Minimize $Z = 2x_1 + 3x_2$, Subject to
$x_1 + x_2 \geq 5$; $x_1 + 2x_2 \geq 6$; and $x_1, x_2, \geq 0$</td><td>BTL -5</td><td>Evaluating</td></tr>
<tr><td>14.(a)</td><td>Solve by Simplex method. Max $Z = 2x_1 + x_2$, Subject to
$x_1 + 2x_2 \leq 10$; $x_1 + x_2 \leq 6$; ; $x_1 - x_2 \leq 2$; $x_1 - 2x_2 \leq 1$, $x_1, x_2, \geq 0$</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>14.(b)</td><td>Solve the assignment problem ,
Job
<table>
<tr><td></td><td>7</td><td>7</td><td>0</td><td>4</td><td>8</td></tr>
<tr><td></td><td>9</td><td>6</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Machine</td><td>11</td><td>5</td><td>7</td><td>0</td><td>5</td></tr>
<tr><td></td><td>9</td><td>4</td><td>8</td><td>9</td><td>4</td></tr>
<tr><td></td><td>8</td><td>7</td><td>9</td><td>11</td><td>3</td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td></td><td>Part - C</td><td></td><td></td></tr>
<tr><td>15.</td><td>Solve the transportation problem
Supply
$$\begin{bmatrix} & 5 & 2 & 4 & 3 & 22 \\ & 4 & 8 & 1 & 6 & 15 \\ & 4 & 6 & 7 & 5 & 8 \\ \text{Demand} & 7 & 12 & 17 & 9 & 45 \end{bmatrix}$$</td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>16.</td><td>Solve the assignment problem ,
Job
<table>
<tr><td></td><td>12</td><td>10</td><td>15</td><td>22</td><td>18</td><td>8</td></tr>
<tr><td></td><td>10</td><td>18</td><td>25</td><td>16</td><td>12</td><td>11</td></tr>
<tr><td>Machine</td><td>10</td><td>3</td><td>8</td><td>5</td><td>9</td><td>6</td></tr>
<tr><td></td><td>6</td><td>14</td><td>10</td><td>13</td><td>13</td><td>12</td></tr>
<tr><td></td><td>8</td><td>12</td><td>11</td><td>7</td><td>13</td><td>10</td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
<tr><td>17.</td><td>Solve by two phase Simplex method Minimize $Z = x_1 - 2x_2 - 3x_3$,
Subject to $-2x_1 + x_2 + 3x_3 = 2$; $2x_1 + 3x_2 + 4x_3 = 1$
and $x_1, x_2, x_3 \geq 0$</td><td>BTL -2</td><td>Understanding</td></tr>
<tr><td>18.</td><td>A travelling sales man has to visit 5 cities .He wishes to start from a particular city, visit each city once and then returns to his starting point. Cost of going from one city to another is shown below. Find the least cost route
<table>
<tr><td></td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td></tr>
<tr><td>A</td><td>∞</td><td>4</td><td>10</td><td>14</td><td>2</td></tr>
<tr><td>B</td><td>12</td><td>∞</td><td>6</td><td>10</td><td>4</td></tr>
<tr><td>C</td><td>16</td><td>14</td><td>∞</td><td>8</td><td>14</td></tr>
</table></td><td>BTL -3</td><td>Applying</td></tr>
</table>

D	24	8	12	∞	10
E	2	6	4	16	∞

UNIT – V FOURIER SERIES: Fourier trigonometric series : Periodic function as power signals–Convergence of series–Even and odd function : Cosine and sine series–Non periodic function : Extension to other intervals-Power signals : Exponential Fourier series–Parseval's theorem and power spectrum–Eigenvalue problems andorthogonal functions–Regular Sturm-Liouville systems–Generalized Fourier series.

Q.No.	Question	Bloom's Taxonomy Level	Domain
	PART – A		
1.	If the periodic function f(t) $=\begin{cases} \mathbf{0} & -\pi < t < 0 \\ \boldsymbol{t}, & \mathbf{0} < t < \pi \end{cases}$ where f(t + 2π) = f(t) is expanded as a Fourier series , find the value of a_n.	**BTL -2**	Understanding
2.	Define energy signals and power signals?	**BTL -1**	Remembering
3.	Find a Fourier sine series for the function f(x) = 1 , 0 < x < π.	**BTL -2**	Understanding
4.	Define a periodic function as power signals.	**BTL -1**	Remembering
5.	Calculate average power of period T =2, f(t) = 2cos 5πt + sin6πt using time domain analysis.	**BTL -2**	Understanding
6.	State Parseval's theorem.	**BTL -1**	Remembering
7.	Find the Fourier constants b_n for x sinx in $(-\pi, \pi)$.	**BTL -3**	Applying
8.	State convergence of the series.	**BTL -1**	Remembering
9.	Write note on Singular Sturm- Liouville System.	**BTL -1**	Remembering
10.	Find the value of $\boldsymbol{a_0}$ in the Fourier series expansion of $\boldsymbol{f(x) = e^x in\ (0, 2\pi)}$.	**BTL -4**	Analyzing
11.	Define self ad joint operator.	**BTL -1**	Remembering
12.	Write the power signals Exponential Fourier Series.	**BTL -2**	Understanding
13.	Define generalized Fourier series?	**BTL -1**	Remembering
14.	If $(\pi - x)^2 = \frac{\pi^2}{3} + 4\sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$ in $0 < x < 2\pi$ then deduce the value of $\sum_{n=1}^{\infty} \frac{1}{n^2}$.	**BTL -4**	Analyzing

15.	Put the following DE in self – ad joint form $x^2 y'' + 3xy' + \lambda y = 0$.	**BTL -4**	Analyzing
16.	Distinguish Periodic and Non Periodic functions, with example.	**BTL -2**	Understanding
17.	Write short note on Eigen value problem and orthogonal functions.	**BTL -2**	Understanding
18.	State the properties of the eigen values of a Regular Sturm-Liouville System.	**BTL -1**	Remembering
19.	Write note on cosine and sine series.	**BTL -1**	Remembering
20.	Find the root mean square value of the function f(x) = x in (0, *l*).	**BTL -5**	Evaluating
	PART –B		
1.(a)	Find the Fourier series of the periodic Ramp function $f(t) = \begin{cases} 0, & -\pi < t < 0 \\ t, & 0 < t < \pi \end{cases}$, $f(t+2\pi) = f(t)$ Using (i) time domain analysis and (ii) Frequency domain analysis.	**BTL -2**	Understanding
1. (b)	Find the Fourier series of the function $f(x) = (\pi - x)^2$, in $(0, 2\pi)$ with periodicity 2π.	**BTL -3**	Applying
2. (a)	Find the fourier series of the sawtoothfunction **f(t) = t, -1 < t <1** where **f(t+2) = f(t).**	**BTL -2**	Understanding
2.(b)	A periodic function f(t) of period 2 is defined by $f(t) = \begin{cases} 3t & 0 \le t \le 1 \\ 3 & 1 \le t \le 2 \end{cases}$, $f(t+2) = f(t)$. Determine a Fourier series expansion for the function and sketch a graph of f(t) for $-4 \le t \le 4$.	**BTL -3**	Applying
3. (a)	Find a fourier series representation of $f(t) = t^2$, $0 < t < 1$. i) as a sine series with period T =2 ii) as a cosine series with period T =2 iii) as a full trigonometric series with period T =1	**BTL -4**	Analyzing
3.(b)	Obtain the half range cosine series for $f(x) = (x-1)^2$ in $0 < x < 1$. Deduce that $\sum_{1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$	**BTL -3**	Applying
4. (a)	Calculate the averge power of the periodic signal, period T =2 $f(t) = 2\cos 6\pi t + \sin 5\pi t$	**BTL -5**	Evaluating
4.(b)	Obtain the Fourier series for $f(x) = 1 + x + x^2$ in $(-\pi, \pi)$.	**BTL -3**	Applying

5. (a)	Find the eigen values and eigen functions of $y'' + \lambda y = 0$, $0 < x < p$, $y(0) = 0, y(p) = 0$.	**BTL -4**	Analyzing
5.(b)	Find the half range sine series of $f(x) = 4x - x^2$ in the interval (0, 4).Hence deduce $\frac{1}{1^3} - \frac{1}{3^3} + \frac{1}{5^3} - \frac{1}{7^3} + \cdots$	**BTL -3**	Applying
6.	Find an expression for the Fourier coefficients associated with the generalisedfourier series arising from the eigen functions of $y'' + y' + \lambda y = 0$, $0 < x < 3$, $y(0) = 0$, $y(3) = 0$.	**BTL -4**	Analyzing
7. (a)	Find the eigen values and eigen functions of $y'' + \lambda y = 0$, $-\pi < x < \pi$, $y(-\pi) = y(\pi)$, $y'(-\pi) = y'(\pi)$.	**BTL -4**	Analyzing
7. (b)	Obtain the cosine series for $f(x) = x$ in $0 < x < \pi$ and deduce that $\sum_{n=1}^{\infty} \frac{1}{(2n-1)^4} = \frac{\pi^4}{96}$	**BTL -3**	Applying
8.	Find the generalized Fourier Series expansion of the function $f(x) = 1$, $0 < x < 1$, in terms of the eign functions of $y'' + y' + \lambda y = 0$, $0 < x < 1$, $y(0) = 0$, $y(1) + y'(1) = 0$.	**BTL -4**	Analyzing
9.	Find the Fourier series of $f(x) = x \sin x$ in $-\pi < x < \pi$. Hence deduce the sum of the series $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \ldots\ldots\ldots \infty = \frac{\pi - 2}{4}$	**BTL -3**	Applying
10.(a)	Find the eigen values and eigen functions of $y'' + y' + \lambda y = 0$, $0 < x < 3$, $y(0) = 0$, $y(3) = 0$.	**BTL -4**	Analyzing
10.(b)	Find the complex form of Fourier series of $f(x) = e^x$ in $-\pi < x < \pi$.	**BTL -3**	Applying
11.(a)	Find the Fourier series expansion of the periodic function f(x) of period $2l$ define by $f(x) = l + x \quad -l \le x \le 0$; $= l - x \quad 0 \le x \le l$ Deduce that $\sum_{1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$	**BTL -3**	Applying
11.(b)	Find the Fourier series for $f(x) = \lvert \cos x \rvert$ in the interval $(-\pi, \pi)$	**BTL -3**	Applying
12.(a)	Find the Fourier series expansion of $f(x) = \begin{cases} -x + 1 \text{ for } -\pi < x < 0 \\ x + 1 \text{ for } 0 < x < \pi \end{cases}$	**BTL -3**	Applying
12.(b)	Find half range cosine series given $f(x) = x \quad 0 \le x \le 1$; $= 2 - x \quad 1 \le x \le 2$	**BTL -3**	Applying
13.(a)	Expand $f(x) = \begin{cases} 1 + \frac{2x}{\pi}, -\pi < x < 0 \\ 1 - \frac{2x}{\pi}, 0 < x < \pi \end{cases}$ as a full range Fourier series in the interval $(-\pi, \pi)$.Hence deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots = \frac{\pi^2}{8}$.	**BTL -3**	Applying
13.(b)	Find the half range sine series of $f(x) = x \cos x$ in $(0, \pi)$	**BTL -3**	Applying

14.	Obtain Fourier series for f(x) of period $2l$ and defined as follows f(x)=$\begin{cases} l-x & in \quad 0 \le x \le l \\ 0 & in \quad l \le x \le 2l \end{cases}$ Hence deduce that (i) 1-$\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+.......=\frac{\pi}{4}$ (ii) $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.......=\frac{\pi^2}{8}$	**BTL -3**	Applying
	Part - C		
15.	Find the Fourier series for f(x) = x^2 in ($-\pi,\pi$). Hence find i) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.........$ ii) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\cdots$. iii) $\frac{1}{1^4}+\frac{1}{2^4}+\frac{1}{3^4}+\frac{1}{4^4}........\infty$	**BTL -3**	Applying
16.	Find the eigen values, eigen functions of y'' + λy = 0, 0 < x < 1, y(0) = 0, y(1) + y'(1) = 0.	**BTL -4**	Analyzing
17.	Find the complex form of Fourier series of $e^{-ax}, -l < x < l$. Deduce that when a is constant other than an integer $cosax = sinal \sum_{n=-\infty}^{\infty} \frac{al}{a^2l^2-n^2\pi^2}(-1)^n e^{in\pi x/l}$	**BTL -4**	Analyzing
18.	State and prove the Parseval's theorem on Fourier coefficients**.**	**BTL -1**	Remembering

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