TAMIL NADU OPEN UNIVERSITY

Chennai – 600 015

Name of the School

HOME ASSIGNMENT

Programme Code	: 231
Programme Name	: M.Sc., (Mathematics)
Course Code	: MMS25
Course Name	: Topology and Functional Analysis
Batch	:
No. of Assignment	: 04
Maximum CIA	: 15 Marks (Average of total no. of Assignments)

ASSIGNMENT-1

Max: 15 Marks.

Answer any ONE of the following three questions.

1. State and prove uniform limit theorem.
2. Let X be a simply ordered set having the l.u.b property. In the order topology each closed interval is compact.
3. State and Prove the Hahn-Banach theorem.

ASSIGNMENT-2

Max: 15 Marks.

Answer any ONE of the following three questions:

1. Prove that the Cartesian product of connected spaces is connected.
2. State and Prove Urysohn's lemma.
3. Prove that a closed convex subset C of a Hilbert space H contains a unique vector of smallest norm.

ASSIGNMENT-3

Max: 15 Marks.

Answer any ONE of the following three questions.

1. If L is a linear continuum in the order topology, then prove that L is connected and so is every interval and ray in L.
2. State and Prove Closed graph theorem.
3. Let H be the given Hilbert space and T^* be adjoint of the operator T. Prove that T^* is a bounded linear transformation and T determines T^* uniquely.

ASSIGNMENT-4

Max: 15Marks.

Answer any ONE of the following three questions.

1. State and Prove Tietze extension theorem.
2. State and prove the Riesz Representation Theorem.
3. State and Prove Gram-Schmidt Orthogonalisation Process.

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HOME ASSIGNMENT

Programme Code	: 231
Programme Name	: M.Sc., (Mathematics)
Course Code	: MMS26
Course Name	: Operations Research
Batch	:
No. of Assignment	: 04
Maximum CIA	: 15 Marks (Average of total no. of Assignments)

ASSIGNMENT-1

Max:15 Marks.

Answer any ONE of the following three questions.

1. Use two – phase simplex method to minimize $Z = \frac{15}{2} x_1 - 3x_2$

Subject to the constraints:

$3x_1 - x_2 - x_3 \geq 3$

$x_1 - x_2 - x_3 \geq 2$

$x_1, x_2, x_3 \geq 0.$

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2. Find the optimum integer solution to the following all I.P.P:

Maximize $Z = x_1 + 2x_2$

Subject to the constraints

$x_1 + x_2 \leq 7$, $2x_1 \leq 11$, $2x_2 \leq 7$,

x_1, $x_2 \geq 0$ and are integers..

3. Derive (M/M/1): (∞, FIFO) queueing model and find all the characteristics of this model.

ASSIGNMENT-2

Max:15 Marks.

Answer any ONE of the following three questions:

1. Solve the following 3 × 3 game by linear programming.

$$\text{Player A}\overset{\textit{player B}}{\begin{bmatrix} 1 & -1 & -1 \\ -1 & -1 & 3 \\ -1 & 2 & -1 \end{bmatrix}}.$$

2. Use dual simplex method to solve the L.P.P.

Minimize $Z = x_1 + 2x_2 + 3x_3$ subject to the constraints:

$$x_1 - x_2 + x_3 \geq 4$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_2 - x_3 \geq 2$$

$$x_1, x_2, x_3 \geq 0.$$

3. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average 36 minutes, calculate the following:

(i) Average number of trains in the yard.

(ii) The probability that the queue size exceeds 10.

ASSIGNMENT-3

Max:15 Marks.

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Answer any ONE of the following three questions.

1. Solve the following 5x2 game graphically:

	B_1	B_2
A_1	-2	5
A_2	-5	3
A_3	0	-2
A_4	-3	0
A_5	1	-4

2. Explain the two – phase technique to solve an L.P.P.

3. Use Branch and Bound to solve the following

$Max.Z = 2x_1 + 2x_2$

Subject to: $5x_1 + 3x_2 \leq 8$

$x_1 + 2x_2 \leq 4$

$x_1,\ x_2\ \geq 0$ and integers

ASSIGNMENT-4

Max:15 Marks.

Answer any ONE of the following three questions.

1. Use linear programming to solve the game probems whose payoff matrices are given below:

$$\begin{bmatrix} 1 & -1 & -2 \\ -1 & 1 & 1 \\ 2 & -1 & 0 \end{bmatrix}$$

2. Explain Integer Programming problem algorithm**.**

3. Explain Pure and Death model**.**

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Name of the School

HOME ASSIGNMENT

Programme Code	:	231
Programme Name	:	M.Sc., (Mathematics)
Course Code	:	MMS27
Course Name	:	Graph Theory and Algorithms
Batch	:	
No. of Assignment	:	04
Maximum CIA	:	15 Marks (Average of total no. of Assignments)

ASSIGNMENT-1

Max:15 Marks.

Answer any ONE of the following three questions.

1. State and prove Tutte's Theorem.
2. Prove that a connected graph *G* is Eulerian if and only if each vertex of *G* has even degree.
3. Prove that every planar graph is 5-vertex colourable.

ASSIGNMENT-2

Max:15 Marks.

Answer any ONE of the following three questions:

1. Prove that when the breadth-first search algorithm halts, each vertex reachable from (given vertex) *v* is labeled with its distance from *v*.
2. State and Prove Whitney Theorem on connectivity.
3. Explain Hungarian algorithm with illustration.

ASSIGNMENT-3

Max:15 Marks.

Answer any ONE of the following three questions.

1. Explain an algorithm to find a spanning tree of a graph and illustrate with example.
2. State and prove Menger's theorem.
3. Prove that after completion of Kruskal's algorithm, T induces a minimum weight spanning tree.

ASSIGNMENT-4

Max:15 Marks.

Answer any ONE of the following three questions.

1. Explain sequential colouring algorithm and illustrate.
2. State and prove Haval and Hakimi theorem.
3. State and Prove Vizing's theorem.

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HOME ASSIGNMENT

Programme Code	:	231
Programme Name	:	M.Sc., (Mathematics)
Course Code	:	MMS28
Course Name	:	Differential Equations
Batch	:	
No. of Assignment	:	04
Maximum CIA	:	15 Marks (Average of total no. of Assignments)

ASSIGNMENT-1

Max:15 Marks.

Answer any ONE of the following three questions.

1. Reduce the equation $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0$ into its canonical form.

2. Derive the Bessel function of order *n* of the second kind.

3. State and Prove Kelvin's inversion theorem.

ASSIGNMENT-2

Max:15 Marks.

Answer any ONE of the following three questions:

1 State and Prove a necessary condition for the existence of the solution of the interior Neumann's problem.

2. Solve the Legendre equation $(1-x^2)y''-2xy'+\alpha(\alpha+1)y=0$.

3. Find the first four successive approximations for the initial value problem $y'=y;\quad y(0)=1$.

ASSIGNMENT-3

Max:15 Marks.

Answer any ONE of the following three questions.

1. Prove that two solutions φ_1, φ_2 of L(y)=0 are linearly independent on I if and only if $W(\varphi_1,\varphi_2)(x) \neq 0 \ \forall \ x \in I$.

2. State and prove Picard's theorem**.**

3. Show that the one-parameter family of surfaces $x^2+y^2=cz^2$ can form a family of equipotential surfaces.

ASSIGNMENT-4

Max:15 Marks.

Answer any ONE of the following three questions.

1 Solve: $y'' + y = 0$, $y(0) = 1$, $y\left(\frac{\pi}{2}\right) = 2$.

2. Define Legendre equation and solve using the power series technique.

3. Discuss the method of solving hyperbolic equations**.**
