TAMIL NADU OPEN UNIVERSITY

Chennai - 15

School of Science

HOME / SPOT ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-25, Topology and Functional Analysis
Batch : CY 2019
No.of Assignment : One Assignment for Each 2 Credits
Maximum CIA Marks : 25 (Average of Total No. of Assignment)

Assignment – I

Answer any one of the question not exceeding 1000 words

1. State and Prove Tietze extension theorem.
2. State and Prove Uryshon's metrization theorem.
3. Prove that every Hilbert space is reflexive.

Assignment – II

Answer any one of the question not exceeding 1000 words

1. State and Prove Hahn-Banach Theorem, proving necessary result.
2. Prove that If N is normed linear space, then the closed unit sphere S^* in N^* is a compact Hausdorff space in the weak* topology.
3. State and prove Open Mapping theorem.

Assignment – III

Answer any one of the question not exceeding 1000 words

1. State and prove Closed Graph theorem, proving necessary result.
2. State and prove Bessel's inequality.
3. If $\{e_i\}$ is an orthonormal set in a Hilbert space H and x is an arbitrary vector in H, then prove that

   $[x - \sum(x, e_i)e_i] \perp e_j$ for each j.

Assignment – IV

Answer any one of the question not exceeding 1000 words

1. Let H be a Hilbert space and let $\{e_i\}$ be an orthonormal set in H. Then the following conditions are equivalent to one another
   (i) $\{e_i\}$ is complete.
   (ii) $x \perp e_i \ \forall i$ implies x = 0.
   (iii) If x is an arbitrary vector in H, then $x = \sum(x, e_i)e_i$.
   (iv) If x is an arbitrary vector in H, then $||x||^2 = \sum|(x, e_i)|^2$.
2. State and prove Riesz Representation Theorem.
3. If T is a positive operator on a Hilbert space H, then prove that I + T is non-singular.

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Programme Code No	: 231
Programme Name	: M.Sc., Mathematics
Course Code & Name	: MMS-26, Operation Research
Batch	: CY 2019
No.of Assignment	: One Assignment for Each 2 Credits
Maximum CIA Marks	: 25 (Average of Total No. of Assignment)

Assignment – I

Answer any one of the question not exceeding 1000 words

1. Use Simplex method to solve the following L.P.P.
   Maximize $Z = 7x_1 + 5x_2$ subject to the constraints
   $x_1 + 2x_2 \leq 6$, $4x_1 + 3x_2 \leq 12$, $x_1, x_2 \geq 0$

2. Use two-phase simplex method to minimize $Z = \frac{15}{2} x_1 - 3x_2$
   Subject to the constraints $3x_1 - x_2 - x_3 \geq 3$, $x_1 - x_2 - x_3 \geq 2$, $x_1, x_2, x_3 \geq 0$.

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

   Minimize $Z = x_1 + 2x_2 + 3x_3$ subject to the constraints
   $x_1 - x_2 + x_3 \geq 4$, $x_1 + x_2 + 2x_3 \leq 8$, $x_2 - x_3 \geq 2$, $x_1, x_2, x_3 \geq 0$.

Assignment – II

Answer any one of the question not exceeding 1000 words

1. Illustrate interior – point algorithm.
2. Apply minimum Spanning Tree algorithm to obtain solution to the Seervada Park problem.
3. Explain the Augmenting Path Algorithm to the Seervada Park problem.

Assignment – III

Answer any one of the question not exceeding 1000 words

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

Player B

$$\text{Player A}\begin{bmatrix} 1 & -1 & -1 \\ -1 & -1 & 3 \\ -1 & 2 & -1 \end{bmatrix}$$

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. Use Branch-and Bound technique to solve the following I.P.P.
   Maximize $Z = 7x_1 + 9x_2$
   Subject to the constraints
   $-x_1 + 3x_2 \leq 6$, $7x_1 + x_2 \leq 35$, $0 \leq x_1, x_2 \leq 7$, x_1, x_2 are integers.

Assignment – IV

Answer any one of the question not exceeding 1000 words

1. Explain Pure Birth and Death Model.
2. Explain Specialized Poisson Queues – M/A/1 Queue.
3. Write a note on Separable Convex Programming.

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HOME / SPOT ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-27, Graph Theory and Algorithms
Batch : CY 2019
No.of Assignment : One Assignment for Each 2 Credits
Maximum CIA Marks : 25 (Average of Total No. of Assignment)

Assignment – I

Answer any one of the question not exceeding 1000 words

1. State and prove Menger's Theorem.
2. Write a note on "Operations of Graphs".
3. State equivalent conditions for a graph to be a Tree and Prove.

Assignment – II

Answer any one of the question not exceeding 1000 words

1. Define an Eulerian Graph, give example and a counter example. Also state and prove a necessary and sufficient condition for a connected graph to be Eulerian.
2. Explain Marriage Problem, proving Hall's Marriage Theorem.
3. State and prove Tutte's Theorem.

Assignment – III

Answer any one of the question not exceeding 1000 words

1. Explain Stable Matching and prove that for every assignment of preferences in a bipartite graph, there is a stable matching.
2. State and prove Vizing's Theorem.
3. State and prove Brooks Theorem.

Assignment – IV

Answer any one of the question not exceeding 1000 words

1. Write a note on Mycielski's Construction.
2. Define the chromatic polynomial of a graph and list some properties of chromatic polynomial and justify your answer.
3. Prove the following are equivalent:

   a) Every planner graph is 4-vertex colourable.

   b) Every plane graph is 4-face colourable.

   c) Every simple 2-edge connected 3-regular planar graph is 3-edge colourable.

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Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-28, Differential Equations
Batch : CY 2019
No.of Assignment : One Assignment for Each 2 Credits
Maximum Marks : 25 (Average of Total No. of Assignment)

Assignment – I

Answer any one of the question not exceeding 1000 words

1. State and prove the Existence Theorem for the initial value problem of a second order linear homogeneous differential equation.

2. Let $\emptyset_1, \emptyset_2, \ldots, \emptyset_n$ are n solutions of a linear differential equation L(y) = 0 on an interval I. Then prove that $\emptyset_1, \emptyset_2, \ldots, \emptyset_n$ are independent on I if and only if $W(\emptyset_1, \emptyset_2, \ldots, \emptyset_n)(x) \neq 0$ for all x in I.

3. Let $\{\emptyset_1, \emptyset_2, \ldots, \emptyset_n\}$ be *n* solutions of a linear homogeneous equation with constant coefficients L(y) = 0 on an interval I containing a point x_0. Then prove that $W(\emptyset_1, \emptyset_2, \ldots, \emptyset_n)(x) = e^{-a1(x-x0)} W(\emptyset_1, \emptyset_2, \ldots, \emptyset_n)(x_0)$.

Assignment – II

Answer any one of the question not exceeding 1000 words

1. Explain the Algorithm of variation of Parameter method and also find a particular solution of $y'' + y = \operatorname{cosec} x$.

2. Find the solution of the initial value problem
$y'' - 2y' + y = 2x,\ y(0) = 6,\ y'(0) = 2$.

3. Prove that for each n there is one and only one polynomial solution $P_n(x)$ of degree n for the Legendre equation $(1 - x^2)y'' - 2xy' + n(n+1)y = 0$ satisfying $P_n(1) = 1$.

Assignment – III

Answer any one of the question not exceeding 1000 words

1. Define Bessel Equation and solve.

2. Find a fundamental matrix of the equation

$$y' = \begin{bmatrix} 1 & 1 & 1 \\ 0 & -2 & 3 \\ 0 & 1 & 0 \end{bmatrix} y$$

3. Solve the initial value problem $y'' - 2y' + y = 0$, $y(0) = 0$, $y'(0) = 1$ on the interval $[0,a]$ where a is any positive real number.

Assignment – IV

Answer any one of the question not exceeding 1000 words

1. State and prove Picard's Theorem.

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

3. Write a note on Characteristic Curves.