TAMIL NADU OPEN UNIVERSITY

Chennai - 15

School of Science

ASSIGNMENT

Programme Code No : 131
Programme Name : B.Sc., Mathematics
Course Code & Name : BMS-31, Real and Complex Analysis
Batch : CY 2020
No.of Assignment : One Assignment for Each 2 Credits
Maximum Marks : 100
Weightage : 25%

Assignment – I

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. State and prove Baire's Category theorem.
2. Prove that the composition of two continuous functions is continuous.
3. Prove that $\mathbb{R}$ is uncountable.
4. State and prove Minkowski's inequality.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. State and prove Holder's inequality and hence deduce Cauchy-Schwarz inequality.
2. State equivalent conditions for a subset A our metric space X is dense in X.
3. Prove that ℓ_2 is complete, with usual notation.

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Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Prove that the continuous image of a connected set is connected.
2. Prove that any compact subset of a metric space is closed and bounded.
3. State and prove Heine Borel Theorem.
4. Prove that a continuous function on a compact set is uniformly continuous.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Prove that $\mathbb{R}$ is connected, proving necessary results.
2. Prove that a metric space X is totally bounded if and only if every sequence in X has a Cauchy subsequence.
3. State and prove Cantor's Intersection Theorem.

Assignment – III

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. State and prove a condition for a bounded function to be Riemann integrable.
2. Prove that any continuous function defined on a closed interval is integrable.
3. State and prove Rolle's theorem.
4. State and prove Generalized Mean value theorem.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. State and prove equivalent conditions for a metric space X to be compact.
2. List Properties of Riemann integral and prove.
3. State and prove first fundamental theorem of Calculus.

Assignment – IV

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. State and prove Liouville's Theorem.
2. State and prove Cauchy's residue theorem.
3. If f is analytic in a region then prove that the real and imaginary parts are harmonic.
4. If f is analytic in a region then prove that the real and imaginary parts satisfy the C-R equations.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. State and prove Cauchy's integral theorem for Rectangle.
2. State and prove Morera's theorem.
3. State and prove maximum modulus theorem.

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School of Science

ASSIGNMENT

Programme Code No : 131
Programme Name : B.Sc., Mathematics
Course Code & Name : BMS-32, Linear Algebra and Boolean Algebra
Batch : CY 2020
No.of Assignment : One Assignment for Each 2 Credits
Maximum Marks : 100
Weightage : 25%

Assignment – I

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Define linearly independent set, linearly dependent set and illustrate.
2. Define rank, nullity of linear transformation and prove that dim V = rank T + nullity T where T is a linear transformation from the vector space V in to vector space W.
3. Prove that the intersection of two subspaces of a vector space is a subspace. What about the union?
4. If A and B are subspaces of a vector space V then prove that $\frac{A+B}{A} \cong \frac{B}{A\cap B}$.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Define the quotient Space and prove it is an vector space.
2. Prove that the set of all linear transformations from V to W is a vector space where V and W are vector spaces
3. Prove that any two bases of a finite dimensional vector space V have the same number of elements, proving necessary results.

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. If W is a subspace of a finite dimensional inner product space then prove that $V = W \oplus W^{\perp}$.
2. State and prove fundamental theorem of Homomorphism on vector spaces
3. Prove that an isomorphism between vector spaces maps a basis of V onto a basis of W.

. 4. State and prove Schwartz's inequality

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. State and prove equivalent conditions for a subset of a vector space to be a basis.
2 Prove that any vector space of dimension n over a field F is isomorphic to $V_n(F)$.
3. Prove that dim W $\leq$ dim V and dim $\frac{V}{W}$ = dim V – dim W where W is a subspace of a finite dimensional vector space V.

Assignment – III

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Prove that every chain is a lattice.
2. Prove that the set of all normal subgroups of a group G is a modular lattice.
3. Show that the vectors (1,3,2), (1,-7,-8), (2,1,-1) of V_3 ($\mathbb{R}$) are linearly dependent.
4. Draw the diagram for the poset $\wp(\{1,2,3\})$ with the relation set inclusion $\subseteq$.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. If A and B are subspaces of a finite-dimensional vector space V, then prove that,

   dim (A + B) = dim A + dim B ï dim (A ∩ B).

2. Explain Gram-Schmidt orthogonalisation process and illustrate.
3. Explain Lagrange Method to reduce a quadratic form to diagonal form and illustrate.

Assignment – IV

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Define a Boolean Ring and list some properties, justify.
2. Is the complement of an element in a lattice unique? When it is unique? Justify.
3. Define a lattice and prove that the lattice L, $a \leq b$ if and only if $a \wedge b = a$.
4. Define a Boolean Algebra and list some properties, justify.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Write a note on Distributive Lattices.
2. Write a note on Modular Lattices.
3. Explain the process of converting a Boolean ring with identity element $1 \neq 0$ in to a

   Boolean algebra.

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School of Science

ASSIGNMENT

Programme Code No : 131
Programme Name : B.Sc., Mathematics
Course Code & Name : BMS-33N, Quantitative Techniques
Batch : CY 2020
No.of Assignment : One Assignment for Each 2 Credits
Maximum Marks : 100
Weightage : 25%

Assignment – I

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Explain Two-phase method.
2. Explain practical rule to avoid cycling in L.P.P.
3. Explain production allocation problem.
4. Explain Big M-method.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Use Charneߴs penalty method to

Minimize $Z = 2x_1 + x_2$

Subject to the constraints:

$3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$

$x_1, x_2 \geq 0$

2. Use two-phase simplex method to

Minimize $Z = \frac{15}{2} x_1$ ï $3x_2$

Subject to the constraints:

$3x_1$ ï x_2 ï $x_3 \geq 3$

x_1 ï $x_2 + x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$

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

Maximize $Z = 7x_1 + 5x_2$

Subject to the constraints:

$x_1 + 2x_2 \leq 6$

$4x_1 + 3x_2 \leq 12$

$x_1, x_2 \geq 0$

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Obtain the dual problem of the following LPP.

Minimize $Z = 2x_1 + 5x_2 + 6x_3$

Subject to the constraints:

$5x_1 + 6x_2$ ï $x_3 \leq 3$

$-2x_1 + x_2 + 4x_3 \leq 4$

$x_1 - 5x_2 + 3x_3 \leq 1$

$-3x_1$ ï $3x_2 + 7x_3 \leq 6$

$x_1, x_2, x_3 \geq 0$

2. Explain Integer programming algorithm.
3. Explain dual simplex algorithm.
4. Show that the dual of the dual is the primal.

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Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Use the duality to solve the following L.P.P.:

   Maximize $Z = 2x_1 + x_2$

   Subject to the constraints:

   $x_1 + 2x_2 \leq 10$
   $x_1 + x_2 \leq 6$
   $x_1 - x_2 \leq 2$
   $x_1 - 2x_2 \leq 1$

   $x_1, x_2, x_3 \geq 0$

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. Maximize $Z = \frac{3}{4}x_1$ ï $150x_2 + \frac{1}{50}x_3$ ï $6x_4$

   Subject to the constraints:

   $\frac{1}{4}x_1$ ï $60x_2 - \frac{1}{25}x_3 + 9x_4 \leq 0$

   $\frac{1}{2}x_1$ ï $90x_2 - \frac{1}{50}x_3 + 3x_4 \leq 0$

   $x_3 \leq 1$

   $x_1, x_2, x_3, x_4 \geq 0$

Assignment – III

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Solve the following game:

	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 Vogel's Approximation method.
3. Explain Hungarian method to solve assignment problem.
4. A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is 20 paise and the set up cost of a production run is Rs.180. How frequently should production run be made?

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

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

Minimize $Z = x_1 + 2x_2 + 3x_3$

subject to the constraints:

$x_1 - x_2 + x_3 \geq 4$

$x_1 + x_2 + 2x_3 \leq 8$

$x_2 - x_3 \geq 2$

$x_1, x_2, x_3 \geq 0$

2. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows:

Persons	Job 1	2	3	4	5
A	8	4	2	6	1
B	0	9	5	5	4
C	3	8	9	2	6
D	4	3	1	0	3
E	9	5	8	9	5

Determine the optimum assignment schedule.

3. Obtain an initial basic feasible solution to the following T.P. using the Vogelȏs approximation method:

Warehouses	Stores I	II	III	IV	Availability
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	-1	4	2	19
Requirement	21	25	17	17	80

Assignment – IV

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. In a railway marshalling yard, goods trains arrive at a rate of 30 trains per day. Assuming that the inter ï 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.

2. A Commodity is to be supplied at a constant rate of 200 units per day. Supplies of any amount can be had at any required time, but each ordering costs Rs.50.00. Cost of holding the commodity in inventory is Rs.2.00 per unit per day while the delay in the supply of the item induces a penalty of Rs.10.00 per unit per delay of 1 day. Find the optimal policy (q,t) where t is the re-order cycle period and Q is the inventory level after re-order. What would be the best policy, if the penalty cost becomes ∞ ?

3. A TV Repairman find that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is approximately Poisson with an average rate of 10 per 8 hours day, what is repairmanâs expected idle time each day? How many jobs are ahead of the average set just brought in?

4. A super market has two girls ringing up sales at the counters. If the service time for each counter is exponential with mean 4 minutes, and if people arrive in a Poisson fashion at the rate of 10 an hour.

   (a) What is the probability of having to wait for service?

   (b) What is the expected percentage of idle time for each girl?

   (c) Find the average queue length as the average number of units in the system.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

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. Explain EOQ model without shortage.
3. Explain (M/M/1): (∞/FIFO) model.

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School of Science

ASSIGNMENT

Programme Code No : 131
Programme Name : B.Sc., Mathematics
Course Code & Name : BMS-34, Programming in C and C++
Batch : CY 2020
No.of Assignment : One Assignment for Each 2 Credits
Maximum Marks : 100
Weightage : 25%

Assignment – I

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Explain the concept óRecursionôand illustrate.
2. Define Fibonacci numbers recursively and write a function that will generate and print the first in Fibonacci numbers.
3. Explain data types in C.
4. Write a note on Type conversion in C.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Explain Control statements available in C.
2. Write a note on a) Polymorphism b) Function overloading
3. Write a note on Storage Class.

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Write a programme to read two strings and interchange them, using pointers.
2. Write a program to create a bio-data of three employees and print them in the screen using fwrite and fread functions.
3. Write a C program to read three numbers and print the largest among them.
4. Write a note on Bitwise shift operators.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1 Explain User defined functions in C.

2. Write a note on Structures and unions in C.

3. Write a note on Arrays in C.

TAMIL NADU OPEN UNIVERSITY

Chennai - 15

School of Science

ASSIGNMENT

Programme Code No	: 131
Programme Name	: B.Sc., Mathematics
Course Code & Name	: BMS-35, Graph Theory
Batch	: CY 2020
No.of Assignment	: One Assignment for Each 2 Credits
Maximum Marks	: 100
Weightage	: 25%

Assignment – I

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Define various operations on graphs and illustrate.
2. Prove that a graph is bipartite if and only if it contains no odd cycle.
3. Define Konigsberg Bridge problem and convert it a graph model.
4. State and prove Turan's theorem.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. State and prove equivalent condition for a graph to be a tree.
2. State and prove Haval and Hakimi theorem and illustrate.
3. Define an Eulerian graph, give an example and a counter example. Also prove that a connected graph G is eulerian if and only if each vertex of G has even degree.

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. State and prove Euler's Formula.
2. Prove that every tournament has a directed Hamilton Path.
3. In any graph G with $\delta > 0$, prove that $\alpha' + \beta' = p$.
4. In a bipartite graph with $\delta > 0$, prove that number of vertices in a maximum independent set is equal to the number of edges in minimum edge covering.

Part – B (2 x 30 = 60 Marks)

Answer any two of the questions. Each question carries 30 marks.

1. Define closure of a graph, illustrate and prove that closure of a graph is well defined. Also prove that if c(G) is complete, then G is hamiltonian when $p \geq 3$.
2. Write a note on Chromatic Polynomial of a graph.
3. State and prove Five-colour theorem, proving necessary result.