Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course-1 **ALGEBRA**

<u>Assignment -1</u>

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. State and prove Lagrange's theorem
2. Prove that every PID is a UFD.

Section - B

II. Answer any one of the following Questions (5 Marks)

1. If $\alpha = (3\ 2\ 15)$ is a cyclic in ρ_6 Compute α^3
2. Prove that the ring Z [i] Gaussian Integers is an Euclidean domain.

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course-1 **ALGEBRA**

Assignment -2

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. If U is an Ideal of a cummutative ring R, define the quotient ring R/u. Also prove R/u is also cummutative.
2. State and prove fundamental theorem of Galois theory.

Section - B

II. Answer any one of the following Questions (5 Marks)

1. If n and m are relatively prime Integers then prove that $Z_{nm} \cong Z_n \times Z_m$
2. Show that every finite extension is an algebric Extension.

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course-2 **REAL ANALYSIS**

Assignment -1

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. (a) Define an open sphere and an open set in a metric space *X*.

   (b) In a metric space, prove that the Union of any collection of open sets is open and intersection of a finite number of open sets is open.

2. Define a connected set. Prove that the only connected subsets of R are intervals.

Section - B

II. Answer any one of the following Questions (5 Marks)

1. Define the cantor set and prove that it is a perfect set.

2. If the collection $\left(K_\alpha : \alpha \in I\right)$ of compact sets of X has finite intersection property, then prove that $\bigcap_{\alpha \in I} k_a$ is non - Empty.

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course-2 **REAL ANALYSIS**

<u>Assignment -2</u>

Max. Marks : 15 | Min Marks : 6

<u>Section - A</u>

I Answer any one of the following Questions **(10 Marks)**

1. (a) If f is a coninuous on $[a,b]$ then prove that $f \in R(\alpha; a, \text{b})$ for every increasing function α on [a,b]

   (b) If f is a monotic on [a,b] and α is continuous on [a,b] then prove that $f \in R(\alpha; a, b)$

2. State and prove monotone convergence theorem.

<u>Section - B</u>

II. Answer any one of the following Questions **(5 Marks)**

1. Evaluate $\int_0^{\frac{\Pi}{2}} \log(\sin x)\, dx$

2. State and prove Egoroff's theorem.

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course-3 **DISCRETE MATHEMATICAL STRUCTURES**

Assignment -1

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. Let B be a finite boolean algebra. Then show that B is isomorphic to Boolean Algebra P(x) of all subsets of suitable set X.

2. Obtain the principal conjuctive normal form of the formula

$$(P \to (Q \wedge R)) \wedge (\neg P \to (\neg Q \wedge \neg R))$$

Section - B

II. Answer any one of the following Questions (5 Marks)

1. Show that every chain is a distributive Lattice.

2. Show that in a Boolean algebra

$$a \le b \leftrightarrow a \wedge b' = 0 \leftrightarrow a' \vee b = 1$$

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course-3 **DISCRETE MATHEMATICAL STRUCTURES**

Assignment -2

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. Define a bi-Partite graph. Show that a graph G is bi-partite is and only if it contains no odd cycles.
2. State and prove Euler's formula for planar graphs.

Section - B

II. Answer any one of the following Questions (5 Marks)

1. Draw the complete bipartite $K_{2,5}$ and complete graph k_5 on five vertices.
2. Prove that every k - chromatic graph has atleast K vertices of degree at least (k-1).

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course - 4 **DIFFERENTIAL EQUATIONS**

Assignment -1

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. Using annihilator method find the particular solution

$y''' + y = Cos\ x + Sin\ x\ on\ R$

2. Obain orthogonlity properties of Hermite polynomials.

Section - B

II. Answer any one of the following Questions (5 Marks)

1. Solve $2y''' + y' - -4y = Cosh\ 5x \quad y(0) = e_n \ y'(0) = -e$

2. With usual notation for non-negative integers m,n prove

$$\int_{-1}^{+1} P_n(x) P_m(x) dx = \begin{cases} 0 & \text{if m+n} \\ \dfrac{2}{2n+1} & \text{if m=n} \end{cases}$$

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course - 4 **DIFFERENTIAL EQUATIONS**

Assignment -2

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. For the initial value problem (IVP)

$$y' = f(x, y) \quad y(x_0) = y_0$$

explaining the notation used in the hypothesis of the theorem, prove the local existence and uniqueness theorems of the IVP.

2. Construct of Liapunov function for the two dimensional system

$$x' = Ax, \text{ where } A = \begin{bmatrix} 1 & 2 \\ 0 & 2 \end{bmatrix}$$

Section - B

II. Answer any one of the following Questions (5 Marks)

1. Find e^{tA} when $A = \begin{bmatrix} 1 & 1 & 1 \\ -1 & 3 & 1 \\ 0 & 0 & 2 \end{bmatrix}$

2. Solve using charpit's method thd equation $\left(P^2 + q^2\right) y = qz$

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course - 5 **TOPOLOGY**

<u>Assignment -1</u>

Max. Marks : 15 | Min Marks : 6

<u>Section - A</u>

I Answer any one of the following Questions (10 Marks)

1. (a) Let X be a topological space, $A \subseteq X.$ Then prove that

i) $\overline{A} = AUD(A)$ ii) A is closed $\Leftrightarrow A \supseteq D$(A)

b) Suppose X is a second countable space. Then prove that every open base for X contains a coustable base.

2) (a) Prove that any compact metric space is sequentially compact.

b) prove that any sequentially compact metric space is totally bounded.

<u>Section - B</u>

II. Answer any one of the following Questions (5 Marks)

1. For any set A in a topological space X prove that

$\left(A^{C}\right) = \left(A^{-}\right)^{C}$

2. Prove that every metric space is a Housdorff space.

Dr. B.R. Ambedkar Open University

Faculty of Science,

DEPARTMENT OF MATHEMATICS

Ist Year M.Sc. (Mathematics) 2020-2021

Course - 5 **TOPOLOGY**

Assignment -2

Max. Marks : 15 Min Marks : 6

Section - A

I Answer any one of the following Questions (10 Marks)

1. (a) State and prove Tychonoff's theorem

   (b) In any metric space prove that every convergent sequence is a cauchy sequence.

2) State and prove Tietzes extension theorem.

Section - B

II. Answer any one of the following Questions (5 Marks)

1. Prove that any finite union of equicontinuous families is again equicontinuous.

2. Prove that a topological space is locally connected if and only if each of it's components is open.