

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-1, Algebra
Assignment-1

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. Define the concept of an ideal of a ring. State and prove Chinese Remainder theorem.
2. Let H, K be normal subgroups of a group G such that $K \subseteq H$. Show that H/K is a normal subgroup of G/K and $(G/K) / (H/K) \cong G/H$.
3. State and prove first sylow's theorem.

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-1, Algebra
Assignment-2

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. Prove that every principal ideal domain is a unique factorization domain
2. If E is a finite normal extension of a field F then prove that E is a splitting field of some polynomial $f(x) \in F[X]$.
3. If $f(x)$ and $g(x)$ are primitive polynomials, then prove that $f(x)g(x)$ is also a primitive polynomial.

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-2, Real Analysis
Assignment-1

Max.Marks:15

Min.Marks:6

Answer all the following questions: (5 X 3 = 15 marks)

1. Define a complete Metric space. State and prove Cantor's Intersection Theorem.
2. State and prove necessary and sufficient condition for a bounded function f on $[a, b]$ to be Riemann-stieltjes integrable.

3. If an infinite product $\prod_{n=1}^{\infty} a_n$ is convergent, then show that $a_n \rightarrow \infty$ as $n \rightarrow \infty$.

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-2, Real Analysis
Assignment-2

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. If f is a continuous real function on $[0,1]$ and $\delta > 0$, then show that there is a polynomial B such that $|f(x) - B(x)| < \delta$ for all $x \in [0,1]$.
2. If f is bounded and R – integrable on $[a, b]$ then show that f is L- integrable and that the L- integral and R- integral of f over $[a, b]$ are equal.
3. Define the Gamma function and prove that $\Gamma(x + 1) = x \Gamma(x)$ for all $x > 0$.

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-3, Discrete Mathematical Structures
Assignment-1

Max.Marks:15

Min.Marks:6

Answer all the following questions: (5 X 3= 15 marks)

1. Construct the truth table for the following questions statement formulae.

i) $(P \rightarrow Q) \wedge ((\neg P) \rightarrow R)$ ii) $\neg(P \vee (Q \wedge R)) \Leftrightarrow (P \vee Q) \wedge (P \vee R)$.

2. Define an atom. Prove that a non zero element p in a Boolean algebra B is an atom if and only if, for any $a \in B$ either $p \wedge a = 0$ or $p \leq a$.

3. Find the disjunctive normal form of the formula $P \wedge (P \rightarrow Q)$.

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Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-3, Discrete Mathematical Structures
Assignment-2

Max.Marks:15

Min.Marks:6

Answer all the following questions: (5 X 3= 15 marks)

1. Define Euler Graph. State and prove a necessary and sufficient condition for a graph to be an Eulerian .
2. Show that every connected graph has a spanning tree.
3. Solve the recurrence relation $a_n = a_{n-1} - 2$; $a_1 = 0$ by iterative method.

Dr.B.R.Ambedkar Open University
Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-4, Differential Equations
Assignment-1

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. Let $\Phi_1, \Phi_2, \dots, \Phi_n$ be solutions of $L(y) = 0$ on I , an interval of R and $x_0 \in I$, then show that $W(\Phi_1, \Phi_2, \dots, \Phi_n)(x) = W(\Phi_1, \Phi_2, \dots, \Phi_n)(x_0) e^{-a_1(x-x_0)} \quad \forall x \in I$.
2. Find all solutions of the differential equation $y''' + y'' + y' + y = x^2 e^x$ on R by using the method of variation of parameters.
3. Prove orthogonality property of chebyshev polynomials.

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Faculty of Science, Department of Mathematics
I year M.Sc. (Mathematics) (Old Batch)
Course-4, Differential Equations
Assignment-2

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. State and prove Liouville's Theorem.
2. Determine the type of stability of the critical point (0, 0) of the system

$$\frac{dx}{dt} = -y - x^2, \quad \frac{dy}{dt} = x.$$

3. Solve $(p^2 + q^2) y = qz$ by using charpit's method.

Dr.B.R.Ambedkar Open University
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I year M.Sc. (Mathematics) (Old Batch)
Course-5, Topology
Assignment-2

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. Show that every separable metric space is second countable.
2. Prove that a metric space is sequentially compact $\Leftrightarrow$ it satisfies the Bolzano-Weierstrass property.
3. State and prove Lindelof's theorem.

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I year M.Sc. (Mathematics) (Old Batch)
Course-5, Topology
Assignment-2

Max.Marks:15

Min.Marks:6

Answer all the following questions:

(5 X 3= 15 marks)

1. State and prove Tietze's extension theorem.
2. Prove that a metric space is sequentially compact $\Leftrightarrow$ it satisfies the Bolzano- Weierstrass property.
3. State and prove Stone -Weierstrass theorem.