TAMIL NADU OPEN UNIVERSITY

Chennai - 15

School of Science

ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-15, Algebra
Batch : AY 2019-20 – I Year
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 Max: 25 Marks

1. State and prove Unique Factorization Theorem on Euclidean ring.
2. If K is a finite extension of F, then G(K:F) is a finite group and its order, O(G(K:Q)) satisfies O(G(K:F)) ≤ [K:F].
3. State and prove Sylowŝ Theorem

Assignment – II

Answer any one of the question not exceeding 1000 words Max: 25 Marks

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1. Prove that V is finite – dimensional over F, then any two bases of V have the same number of elements.
2. Prove that K is a normal extension of F iff K is the splitting field of some polynomial over F.
3. Prove that every finite abelian group is the direct product of cyclic groups.

Assignment – III

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. If A and B are finite dimensional subspaces of a vector space V, then prove that A + B is finite dimensional and dim (A + B) = dim A + dim B – dim (A∩B).
2. If T ∈ A (V) has all its characteristic roots in F, then prove that there is a basis of V in which the matrix of T is triangular.
3. Prove that Two abelian groups of order p^n are isomorphic iff they have the same invariants.

Assignment – IV

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Show that the number e is transcendental.
2. Prove that two nilpotent linear transformations are similar if and only if they have the same invariants.
3. R is a commutative ring with unit element and M is an ideal of R. Prove that M is a maximal ideal of R iff R/M is a field.

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ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-16, Real Analysis
Batch : AY 2019-20 – I year
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 Max: 25 Marks

1. If f is monotonic on [a,b] and α is monotonically increasing and continuous function on [a,b] with α(a) and α (b) finite, then prove that f$\in R(\alpha)$ on [a,b].
2. State and prove Inverse function theorem.
3. Prove that every k-cell in R^k is compact.

Assignment – II

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Write a note on Rectifiable curves.
2. State and prove Implicit function Theorem.
3. State and prove Heine Borel theorem

Assignment – III

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. State and prove Stone weierstrass theorem.
2. State and prove Rank theorem.
3. State and prove Riemann's Theorem on rearrangement.

Assignment – IV

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Prove that any polynominal with complex co-efficient has a root in C.

1. Define a contraction map and prove that if Ø is a contraction map on a complete metric space then prove that it has one and only fixed point.

2. 3. Define uniformly continuous function. Also prove that if f is a continuous mapping of a compact metric space X into a metric space Y, then f is uniformly continuous. Is compactness necessary in this result?

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ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-17, Complex Analysis and Numerical Analysis
Batch : AY 2019-20 – I year
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 Max: 25 Marks

1. Expand $\frac{z}{(z-1)(2-z)}$ in Laurent series valid for i) $|z|< 1$, ii) $1< |z|< 2$, iii) $|z| > 2$ iv) $|z-1| > 1$,

   (v) $0 < |z-2| < 1$.

2. Solve : y' = xy, y(1) = 2, for x = 1.4 using Runge-Kutta method.
3. Use Bisection method to find the approximate value of the root of the equation

   $3x - \sqrt{1+\sin x} = 0$.

Assignment – II

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Solve the system of equations by Gauss-Seidel method.

   $8x - y + z = 18$, $2x + 5y - 2z = 3$, $x + y - 3z = -6$.

2. Using modified Euler method, find the value of y when x = 0.3, given that $\frac{dy}{dx} = x + y$, y(0)=1.
3. Explain Gauss elimination method and solve the following system of equations by Gauss elimination method.

   $10x_1 + x_2 + x_3 = 12$, $x_1 + 10x_2 + x_3 = 12$, $x_1 + x_2 + 10x_3 = 12$.

Assignment – III

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Use power method to find the dominant eigen value and eigenvector of

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

2. Explain Milne method and apply to find y(1.0) given that $y' = x-y^2$, y(0) = 0.]

3. Explain Gauss - jordan method and solve the following system of equations by Gauss jordan method.

   $10x_1 + x_2 + x_3 = 12$, $x_1 + 10x_2 + x_3 = 12$, $x_1 + x_2 + 10x_3 = 12$.

Assignment – IV

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Solve : $\frac{dy}{dx} = x + y$, y(0) = 1 by the Picard method of successive approximations.

2. Derive Simpson's one –third rule and Apply Simpson's one –third rule to evaluate the

   approximate value of the integral by dividing the range into 8 equal parts.

   $$\int_{2}^{10} \frac{dx}{1 + x}$$

3. Solve the following equation using Guass-Jacobi iteration method.

   $20x + y - 2z = 17$, $3x + 20y - z = -18$, $2x - 3y + 20z = 25$.

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ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name : MMS-18, Mathematical Statistics
Batch : AY 2019-20 – I year
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 Max: 25 Marks

1. Write a note on Normal Distribution.
2. Let Z_n be χ^2 (n). Find the limiting distribution of the random variable $y_n = \frac{z_n - n}{\sqrt{2n}}$.
3. Write a note on Conditional Probability.

Assignment – II

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Find the moment generating function of a bivariate normal distributions.
2. Let the random variable X have the probability density function f (x) = $\begin{cases} 1\,; 0 < x < 1 \\ 0\,; \text{elsewhere} \end{cases}$
   Let X_1 and X_2 denote a random sample from this distribution. Find the joint probability density function of Y_1 and Y_2 where $Y_1 = X_1 + X_2$, $Y_2 = X_1 - X_2$. Find also marginal probability density function of Y_1 and Y_2 .
3. Let f (x,y) = 2, 0 < x < y, 0 < y < 1, zero elsewhere, be the joint probability density function of X and Y. show that the conditional means are, respectively $\frac{1+x}{2}$, 0 < x < 1 and $\frac{y}{2}$, 0 < y < 1. show also that the correlation coefficient of X and Y is $\rho = \frac{1}{2}$.

Assignment – III

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Show that $Y = \frac{1}{1+\frac{r_1}{r_2}F}$ where F has an F distribution with parameters r_1 and r_2 has a beta distribution.
2. Let X_1, X_2, X_3 denote a random sample of size 3 from a distribution that is n(0,1). Find the probability density function of $Y = X_1^2 + X_2^2 + X_3^2$.
3. Write a note on Poisson Distribution.

Assignment – IV

Answer any one of the question not exceeding 1000 words Max: 25 Marks

1. Write a note on Stochastic convergence.
2. Let $X_1, X_2, X_3, \ldots, X_n$ denote a random sample of size $n \geq 2$ from a distribution that is n (μ, σ^2). Let $\bar{X}$ and S^2 be the mean and variance of this random sample. Then
   (a) $\bar{X} \sim n\left(\mu, \frac{\sigma^2}{n}\right)$
   (b) $n\frac{S^2}{\sigma^2} \sim \chi^2(n-1)$ and
   (c) $\bar{X}$ and S^2 are stochastically independent.
3. Write a note on Binomial Distribution .