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 : CY 2020 and previous CY Batches
No. of Assignment : One Assignment for Each 2 Credits
Maximum CIA : 15Marks (Average of total no. of Assignments)

Assignment – I

Max: 15 Marks

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

1. If $p(x)$ is irreducible in $F[x]$ and if V is a root of $p(x)$ then prove that $F(v)$ is isomorphic to $F'(w)$ where w is a root of $p'(t)$. Also prove that this isomorphism σ can so be chosen such that σ: $F(v) \rightarrow F'(v)$ 1. $v\sigma = w$ 2. $\alpha\sigma = \alpha'$ for every $\alpha \in F$.
2. Prove that S_n is not solvable for $n \geq 5$.
3. Prove that $F^{(n)}$ is isomorphic to $F^{(m)}$ iff n = m.

Assignment – II

Max: 15 Marks

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

1. If a and b in K are algebraic over F of degrees m and n respectively, then prove that $a \pm b$, ab and a/b (if $b \neq 0$) are algebraic over F of degree at most mn.
2. Prove that any splitting Fields E and E$'$ of the polynomials $f(x) \in F[x]$ and $f'(t) \in F'[t]$ respectively are isomorphic by an isomorphism ϕ with the property that $\alpha\phi = \alpha$ for every $\alpha \in F$. (In particular, any two splitting fields of the same polynomial over a given field F are isomorphic by an isomorphism leaving every element of F fixed).
3. If V is finite dimensional and W is subspace of V, then prove that $\widehat{W}$ is isomorphic to $\hat{V}$/A(W) and dim A(W) = dim V – dim W.

Assignment – III

Max: 15 Marks

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

1. Any finite extension of a field of characteristic zero is a simple extension.
2. Write a note on Nilpotent Transformations.
3. Write a note on Construction with straight edge and compass.

Assignment – IV

Max: 15 Marks

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

1. Prove that Homomorphic image of a solvable group is solvable.
2. Prove that the invariants of a nilpotent transformations T is unique.
3. If p(x) is a polynomial in F[*x*] of degree $n \geq 1$ and is irreducible over F, then prove that there is an extension E of F such that [E:F] = n, in which p(*x*) has a root.

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ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name: MMS-16, Real Analysis
Batch : CY 2020 and previous CY Batches
No. of Assignment : One Assignment for Each 2 Credits
Maximum CIA : 15Marks (Average of total no. of Assignments)

Assignment – I

Max: 15 Marks

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

1. Prove that Uniform limit of integrable functions is integrable.
2. State and prove Rank Theorem.
3. Write a note on “Continuity and Compactness”.

Assignment – II

Max: 15 Marks

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

1. Prove that there exists real continuous function on the real line which is nowhere differentiable.
2. Write a note on exponential functions and logarithmic functions.
3. Write a note on “Continuity and Connectedness”.

Assignment – III

Max: 15 Marks

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

1. Prove that if f is a continuous complex function on [a, b], there exists a sequence of polynomials P_n such that $\lim_{n \to \infty} P_n(x)$ = f(x) uniformly on [a, b].
2. State and prove inverse functions theorem.
3. Write a note on mean value theorems.

Assignment – IV

Max: 15 Marks

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

1. State and prove Implicit function theorem.
2. Discuss whether continuity, differentiability, integrability and limit process are preserved under limit operations.
3. Write a note on Riemann-Stieltjes Integration.

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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 : CY 2020 and previous CY Batches
No. of Assignment : One Assignment for Each 2 Credits
Maximum CIA : 15Marks (Average of total no. of Assignments)

Assignment – I

Max: 15 Marks

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

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

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

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

3. 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.

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

Assignment – II

Max: 15 Marks

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

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

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

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

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

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

Assignment – III

Max: 15 Marks

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

1. Explain Gauss elimination method and solve the following system of equations by Gauss elimination method.

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

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

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

3. Using modified Euler method, find the value of y when x = 0.3, given that $\frac{dy}{dx} = x + y$, $y(0)=1$.

Assignment – IV

Max: 15 Marks

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

1. Use Bisection method to find the approximate value of the root of the equation $3x - \sqrt{1 + \sin x} = 0$.
2. 2. 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) $0 < |z - 2| < 1$.
3. Solve : $y' = xy$, $y(1) = 2$, for x = 1.4 using Runge-Kutta method.

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ASSIGNMENT

Programme Code No : 231
Programme Name : M.Sc., Mathematics
Course Code & Name: MMS-18, Mathematical Statistics
Batch : CY 2020 and previous CY Batches
No.of Assignment : One Assignment for Each 2 Credits
Maximum CIA : 15Marks (Average of total no. of Assignments)

Assignment – I

Max: 15 Marks

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

1. 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 $\overline{X}$ and S^2 be the mean and variance of this random sample. Then

   (a) $\overline{X} \sim n\left(\mu, \frac{\sigma^2}{n}\right)$

   (b) $n\frac{S^2}{\sigma^2} \sim \chi^2$ (n – 1) and

   (c) $\overline{X}$ and S^2 are stochastically independent.

2. Write a note on Binomial Distribution .

3. Write a note on Stochastic convergence.

Assignment – II

Max: 15 Marks

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

1. 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 $Y = X_1^2 + X_2^2 + X_3^2$.

2. Write a note on Poisson Distribution.

3. Show that $Y = \frac{1}{1+\frac{r1}{r2}F}$ where F has an F distribution with parameters r_1 and r_2 has a beta distribution.

Assignment – III

Max: 15 Marks

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

1. 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 .

2. 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 $\rho = \frac{1}{2}$.

3. Find the moment generating function of a bivariate normal distributions.

Assignment – IV

Max: 15 Marks

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

1. Let Z_n be χ^2 (n). Find the limiting distribution of the random variable $y_n = \frac{z_n - n}{\sqrt{2n}}$.

2. Write a note on Conditional Probability.

3. Write a note on Normal Distribution.