TAMIL NADU OPEN UNIVERSITY

Chennai - 15

School of Science

ASSIGNMENT

Programme Code No	: 131
Programme Name	: B.Sc., Mathematics
Course Code & Name	: BMS-21, Groups and Rings
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. In a group G, prove that the equations ax = b and ya = b have unique solutions for x and y in G.
2. Prove that the intersection of two subgroups of a group is also a subgroup. What about the union?
3. Define equivalence relation and give and example.
4. Show that the set of all n^{th} roots of unity with usual multiplication is a group.

Part – B (2 x 30 = 60 Marks)

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

1. Write a note on Symmetric group.
2. a) Define Centre of a group, illustrate and prove that the centre of a group G is a subgroup of G.

   b) Write a note on Normalizer in group.
3. Define product of two subgroups, illustrate and state a necessary and sufficient condition for product of two subgroups to be a subgroup.

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. State and prove equivalent conditions for a subgroup to be a normal subgroup of G.
2. Show that if a group G has exactly one subgroup H of given order, then H is a normal subgroup of G.
3. Prove that a subgroup of a cyclic group is cyclic.
4. State and prove Format's theorem.

Part – B (2 x 30 = 60 Marks)

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

1. Find the number of generators of the group $(Z_{12}, \oplus)$, proving all necessary results.
2. State and prove Lagrange's theorem, proving necessary results.
3. Define Index of a subgroup of a group, illustrate and prove that If H and K are two subgroups of G of finite index in G then $H \cap K$ is a subgroup of finite index in G.

Assignment – III

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Define an Integral Domain, give example and a counter example. Justify.
2. Prove that Z_n is an integral domain if and only if n is prime.
3. Define a normal subgroup and show that A_n is a normal subgroup of S_n.
4. Write note on inner automorphism.

Part – B (2 x 30 = 60 Marks)

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

1. State and prove Cayleyῷs Theorem..
2. a) Define a field, give example and prove that any finite integral domain is a field.

   b) Prove that a finite commutative ring R without zero-divisors is a field.
3. State and prove the fundamental theorem of homomorphism on groups

Assignment – IV

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. R be a commutative ring with identity. Prove that an ideal P of R is a prime ideal if and only if R/P is an integral domain.
2. Prove that the characteristic of any field is either a prime number or zero.
3. Define a field, an integral domain and prove that every field is an integral domain.
4. Give an example of a maximal ideal and also an ideal which is note maximal.

Part – B (2 x 30 = 60 Marks)

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

1. State and prove the fundamental theorem of homomorphism on rings.
2. Show that any integral domain D can be embedded in a field F and every element of F can be expressed as a quotient of two element of D.
3. Prove that any Euclidean domain R is a unique factorization domain.

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ASSIGNMENT

Programme Code No : 131
Programme Name : B.Sc., Mathematics
Course Code & Name : BMS-22, Statistics and Mechanics
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. Compare various measures of dispersion.
2. Write a note on Moments.
3. Find the standard deviation and hence quartile deviation

x	1	3	5	7	9
f	1	4	6	4	1

4. The average production of wheat in two lands for a period of 8 years is given below. Find which land is more homogeneous.

X	22	26	29	30	31	31	34	35
F	20	20	21	29	27	24	27	31

Part – B (2 x 30 = 60 Marks)

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

1. Calculate the first four moments about mean and also find the skewness and kurtosis for the distribution below.

X	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
F	2	1	2	6	16	27	16	7	3	1	1

2. Fit a straight line to data below

Year	1984	1985	1986	1987	1988	1989
Production	7	9	12	15	18	23

3 Fit a parabola for the data given below.

x	1	2	3	4
f	9	24	47	78

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks

1. An urn contains 10 white and 5 black balls while another urn contains 3 white and 7 black balls. One urn is chosen at random and two balls are drawn from it. Find the probability that both balls are white.
2. If the heights of 250 students are distributed normally with mean 65 inches and standard deviation 3.5 inches. How many students have height i) greater than 70 (ii) between 60 and 75 in inclusive.
3. If x and y are two random variables and u = x + y, v = x ï y then find $r_{u,v.}$
4. Show that the coefficient of rank correlation lies between ï 1 and 1.

Part – B (2 x 30 = 60 Marks)

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

1. Find the coefficient of rank correlation for the following data which shows the heights a sample of 12 fathers and their sons.

Height of Father	65	63	67	64	68	62	70	66	68	67	69	71
Height of son	68	66	68	65	69	66	68	65	71	67	68	70

2 Write properties of Moment Generating Function.

3. Fit a normal distribution to be the following data

x	0	1	2	3	4	5
f	10	14	19	8	5	4

Assignment – III

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. If V_1 and V_2 be the velocities of a projectile at the ends of a focal chord of its path and U is the velocity at the vertex. Prove that $V_1^{-2} + V_2^{-2} = U^{-2}$.
2. Derive pedal equation (p ï r equation) of a central orbit.
3. A clock with a secondô pendulum loses 40 seconds per day at a place where the acceleration due to gravity is $981 cm/sec^2$. Find what change in the length is necessary to make it accurate.
4. A particle is projected at an angle 30^o with a velocity 490m/sec. Find (i) the greatest height attained, ii) the time of flight and iii) the horizontal range.

Part – B (2 x 30 = 60 Marks)

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

1. Show that the path of the projectile is a parabola. Also derive the greatest height attained by a projectile and time taken to reach the maximum height.
2. Discuss direct impact of two smooth spheres.
3. Write a note on simple harmonic motion.

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ASSIGNMENT

Programme Code No : 131
Programme Name : B.Sc., Mathematics
Course Code & Name : BMS-23, Classical Algebra and Numerical Methods
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. Establish the inequality: $a^4 + b^4 + c^4 > abc\,(a + b + c)$.
2. Show that the greatest value of $xyz(d - ax - by - cz)$ is $\frac{d^4}{4^4abc}$ provided that all the factors are positive.
3. Find the coefficient of x^n in the expansion of $\frac{1+2x-3x^2}{e^x}$
4. Sum to infinity : $\frac{3}{1!}+\frac{4}{3!}+\frac{5}{5!}+\frac{6}{7!}+ \ldots$

Part – B (2 x 30 = 60 Marks)

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

1. Sum the series $\sum_{n=0}^{\infty}\frac{(n+1)^3}{n!}\,x^n$
2. Find the condition that the roots of the equation $ax^3 + 3bx^2 + 3cx + d = 0$ may be in Geometric Progression and hence solve the equation $27x^3 + 42x^2 - 28x - 8 = 0$.
3. Show that the sum of the ninth powers of the roots of the equation $x^3 + 3x + 9 = 0$ is zero.

Assignment – II

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Find the equation whose roots are the roots of $4x^5 - 2x^3 + 7x - 3 = 0$ each increased by 2.
2. Use Newton – Raphson method to obtain a root correct to three decimal places of the equation $x^3 + 3x^2 - 3 = 0$.
3. Show that in an equation with rational coefficients irrational roots occur in pairs.
4. Remove the fractional coefficients from the equation $2x^3 + \frac{3}{2}x^2 - \frac{1}{8}x - \frac{3}{16} = 0$.

Part – B (2 x 30 = 60 Marks)

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

1. If α, β, γ are the roots of the equation $x^3 - 7x + 7 = 0$, find $\frac{1}{\alpha^4} + \frac{1}{\beta^4} + \frac{1}{\gamma^4}$.
2. Solve the equation $x^5 + 4x^4 + x^3 + x^2 + 4x + 1 = 0$.
3. Solve the equation $x^4 - 4x^3 + 4x^2 + x - 2 = 0$ by finding the rational roots.

Assignment – III

Part – A (4 x 10 = 40 Marks)

Answer all questions. Each question carries 10 marks.

1. Represent the function $f(x) = 2x^3 - 3x^2 + 4x - 8$ and is differences in the factorial notation.
2. Given the set of tabulated points (1,-3), (3,9), (4,30) and (6,132), obtain the value of y when x = 2 using Newton's Divided difference formula.
3. Obtain a root, correct to three decimal places, for the equation $x^3 - 4x - 9 = 0$ using the bisection method.
4. Solve the following system of equations by Gauss – Jordan method:
   $3x + 2y + 4z = 7$, $2x + y + z = 4$, $x + 3y + 5z = 2$.

Part – B (2 x 30 = 60 Marks)

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

1. Applying Lagrange's formula, find a cubic polynomial which approximates the following data and hence find y(1).

X	-2	-1	2	3
Y(x)	-12	-8	3	5

2. Evaluate $\int_1^3 \frac{1}{x} dx$ by Simpson's rule with 4 strips and 8 strips respectively.

3. Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2 + 1}$ with y(0) = 0. Obtain y(0.25), y(0.5) and y(1.0) correct to four decimal places by Picard's method of Successive approximations.