Assignment 1

Class: 12

Subject: Mathematics

1. a. In how many ways can 4 boys and 3 girls be seated in a row containing 7 seats if they may sit any where? [2]

   b. Show that:

   $\frac{1}{2}\left(e+\frac{1}{e}\right)=1+\frac{1}{2!}+\frac{1}{4!}+\frac{1}{6!}+\cdots$ [2]

   c. Prove that in a group the identity element is unique. [2]

2. a. Find the eccentricity and the foci of the hyperbola $3x^2-4y^2=36$. [2]

   b. Find the direction cosines of a line which are equally inclined to the axes. [2]

   c. ABCD is a parallelogram; G is the point of intersection of its diagonals and if O is any point, show that $\overrightarrow{OA}+\overrightarrow{OB}+\overrightarrow{OC}+\overrightarrow{OD}=4\overrightarrow{OG}$. [2]

3. a. Find the slope and the inclination with the x-axis of the tangent to $x^2+y^2=36$ at (0, 6). [2]

   b. Evaluate:

   $\int \frac{dx}{4x^2+25}$ [2]

   c. If $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$, prove that $\vec{a}$ as perpendicular to $\vec{b}$. [2]

4. a. Solve:

   $e^{x-y}dx+e^{y-x}dy=0$ [2]

   b. Find the standard deviation for 20, 30, 25, 27, 26 and 28. [2]

   c. If 2P(A)=3P(B)=4[P(c)] where A, B, C are mutually exclusive events, find the probability of each of them. [2]

5. a. In how ways many can the letters of the word 'MONDAY' be arranged? How many of these arrangements do not begin with M? How many began with M and do not end with N? [4]

   b. Let $S=\{1,-1,i,-i\}$ where $I=\sqrt{-1}$ and '.' denote the complex number multiplication prove that it is a group. [4]

6. a. Prove that the line $3x+4y+6=0$ is tangent to the parabola $2y^2=9x$. Find its point of constant. [4]

   OR

   Find the eccentricity, the coordinates of the vertices and the foci of the ellipse $9x^2+5y^2-30y=0$.

   b. Find the equation of the plane through the points (2, 2,1) and (9, 3, 6) and normal to the plane $2x+6y+6z=9$. [4]

7. a. Evaluate:

   $\int \frac{dx}{1+2sinx}$ [4]

   b. Solve:

   $(1+x)^2\frac{dy}{dx}+2xy=ex^2$ [4]

   OR

   Solve:

   $\frac{dy}{dx}=\frac{y}{x}+tan\frac{y}{x}$

. a. Find Bowleys coefficient of skewness for the following: [4]

Profit	0-10	10-20	20-30	30-40	40-50
No. of shops	8	13	16	8	5

b. Suppose that in a certain city 40% of all recorded births are males. Suppose we select 5 birth records, then what is the probability that (i) Exactly 3 of them are males. (ii) More than 4 are males. [4]

9. Show that the middle term in the expansion of $\left(x-\frac{1}{x}\right)^{2n}$ is $\frac{1.3.5.....(2x-1)(-2)^n}{n!}$. [6]

10. Define vector product of two vectors. Using vector method, prove that $\frac{sinA}{a}=\frac{sinB}{b}=\frac{sinC}{c}$. [6]

11. State mean value theorem. Interpret it geometrically. Verify mean value theorem for the function $f(x)=(x-1)(x-2)(x-3)$ in [1, 4]. [6]

12. a. Write short notes on computational error. [2]

b. Convert $(10110110111)_2$ into decimal number. [2]

c. Evaluate $\int_1^2 x^2dx$ using trapezoidal rule. [2]

13. a. Using Gauss elimination method, solve that following:

$x-2y+3z=2,\ 2x-3y+z=1,\ 3x-y+3z=9$

OR

Solve $x+y+z=4,\ 2x-y+z=3,\ x-2y+3z=5$ using Gauss Sedial method. [4]

b. Evaluate $\int_0^{\pi} sinxdx,\ n=6$ using Simpson's rule. [4]

14. a. Maximize $P=3x+5y$ subject to the constraints $3x+2y\leq 18$

$x\leq 4$

$y\leq 6$ and $x\geq 0,\ y\geq 0$. [6]

b. Show that the equation $f(x)=x^2-x+4=0$ has one positive root and using the method of bisection, find the positive root correct to 3 places of decimal. [6]

OR

Using Newton Raphson method, find the cube root of 60 correct to 3 decimal places.

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