Enrollment No: ______________________ **Exam Seat No:**______________________

C.U.SHAH UNIVERSITY

Summer Examination-2020

Subject Name: Problem Solving - II

Subject Code: 5SC03PRS1 **Branch: M.Sc. (Mathematics)**

Semester : 3 **Date : 05/03/2020** **Time : 02:30 To 05:30** **Marks :70**

Instructions:

(1) Use of Programmable calculator and any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

SECTION – I

Q-1 **Attempt the following** **(07)**

a. Form partial differential equation from $z = A\,e^{pt}\sin px$, where A and p are constants. **(02)**

b. Find $\Delta^2 x^3$ at $x = 0$. **(02)**

c. Find the product of $(1\ 2\ 4\ 5)(3\ 2\ 1\ 5\ 4)$. **(02)**

d. Write relation between E and Δ. **(01)**

Q-2 **Attempt all questions** **(14)**

a. Find Particular Integral of $\left(D^2 - 2DD' + D'^2\right)Z = e^{x+2y}$. **(05)**

b. Solve: $z\,(x+y)p + z\,(x-y) = x^2 + y^2$. **(05)**

c. Solve: $pqz = p^2(xq + p^2) + q^2(yp + q^2)$using Charpit's method. **(04)**

OR

Q-2 **Attempt all questions** **(14)**

a. Find the complete integral of$(p^2 + q^2)y = qz$. **(05)**

b. Solve: $x_2x_3p_1 + x_3x_1p_2 + x_1x_2p_3 + x_1x_2x_3 = 0$. **(05)**

c. Solve: $p + 3q = 5z + \tan(y - 3x)$. **(04)**

Q-3 **Attempt all questions** **(14)**

a. Find a complete integral of $p^2 - y^2q = y^2 - x^2$. **(05)**

b. Let G be a group, H and K be subgroups of G,if $\big(o(H), o(K)\big) = 1$ then what we can say about $o(H \cap K)$? **(05)**

c. Find the characteristics of $4r + 5s + t + p + q - 2 = 0$ **(04)**

OR

Q-3 **Attempt all questions** **(14)**

a. Solve for a positive root of $x^3 - 4x + 1 = 0$ by Regula Falsi method. **(05)**

b. For which values of n, is the polynomial $P(x) = x^3 - nx + 2$ reducible over Q? **(05)**

	c.	Using the Euler's theorem, find the remainder obtained on dividing 3^{256} by 14.	**(04)**

SECTION – II

Q-4		**Attempt the following**	**(07)**
	a.	Find the number of cosets of $H = (4\mathbf{Z}, +)$ in $G = (\mathbf{Z}, +)$.	**(02)**
	b.	Classify the following Partial Differential Equation : $x^2 r - 2s + t = 0$.	**(02)**
	c.	Write sterling's formula.	**(02)**
	d.	Every field is integral domain. True/False.	**(01)**
Q-5		**Attempt all questions**	**(14)**
	a.	Find the positive root of $x = \cos x$ using Newton – Raphson method.	**(05)**
	b.	Solve $\frac{dy}{dx} = x + y, y(0) = 1$. Obtain $y(0.1)$ using Picard's method.	**(05)**
	c.	Using Lagrange's formula to fit a polynomial to the data	**(04)**

X	-1	0	2	3
Y	-8	3	1	12

and hence find $Y(1)$

OR

Q-5		**Attempt all questions**	**(14)**
	a.	Solve the system of equations $3x + y - z = 3, \quad 2x - 8y + z = -5, \quad x - 2y + 9z = 8$ Using Gauss Elimination method.	**(07)**
	b.	Solve the following system of equation by Gauss Seidel method. $10x - 5y - 2z = 3, \quad 4x - 10y + 3z = -3, x + 6y + 10z = -3.$	**(07)**
Q-6		**Attempt all questions**	**(14)**
	a.	Solve $\frac{dy}{dx} = x^2 - y$ given $y(0) = 1$.Find $y(0.1)$ using Runge Kutta's method (take $h = 0.1$).	**(05)**
	b.	Let H is a subgroup of $G$and $a \in G$. Define $aHa^{-1} = \{aha^{-1} : h \in H\}$. Show that aHa^{-1} is a subgroup of G.	**(05)**
	c.	If $\Delta f(x) = 2x^3 - 6x^2 + 7x + 10$ then find $f(x)$.	**(04)**

OR

Q-6		**Attempt all Questions**	**(14)**
	a.	Factorize $x^2 + x + 5$ in $F[x]$, where F is the field of integers mod 11.	**(05)**
	b.	Prove that every field is a Euclidean ring.	**(05)**
	c.	If R is a finite commutative ring with unit then prove that every prime ideal of R is a maximal ideal of R.	**(04)**