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

C.U.SHAH UNIVERSITY

Summer Examination-2016

Subject Name:Partial Differential Equations

Subject Code:5SC02MTC2 **Branch: M.Sc.(Mathematics)**

Semester: 2 **Date:06/05/2016** **Time:10:30 To 1:30** **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 questions** **(07)**

a. Solve:$(D^2 - D')z = 0$. **(02)**

b. Find the particular integral of$(D^2 + 2DD' + D'^2)z = \sin(2x + 3y)$. **(02)**

c. Classify the partial differential equation $r + 4s + 4t = 0$. **(02)**

d. Find the solution of $\frac{\partial^2 z}{\partial x^2} = 0$. **(01)**

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

a. Reduce the equation $r + 2s + t = 0$ to canonical form. **(06)**

b. Solve: $(D^3 - 6D^2D' + 11DD'^2 - 6D'^3)z = e^{5x+6y}$. **(05)**

c. Eliminate the arbitrary functions f and $g$from $z = f(x^2 - y) + g(x^2 + y)$. **(03)**

OR

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

a. Reduce the equation $4r = t$ to canonical form and hence solve it. **(06)**

b. Solve: $r - t = x - y$. **(05)**

c. Eliminate the arbitrary functions f and $F$from $y = f(x - at) + F(x + at)$. **(03)**

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

a. Find the particular integral of$(D^2 - D'^2 + D - D')z = e^y(x - 1)$. **(05)**

b. Solve: $x^2r + 2xys + y^2t = 0$. **(05)**

c. Solve: $(D^3 + 3D^2D' - 4D'^3)z = 0$. **(04)**

OR

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

a. Solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ by the method of separation of variables. **(05)**

b. Solve: $r + s - 6t = y\cos x$. **(05)**

c. Prove that $F(D, D')e^{ax+by} = F(a, b)e^{ax+by}$, where a and b are constants. **(04)**

SECTION – II

Q-4		**Attempt the Following questions**	**(07)**
	a.	What is equipotential surface?	**(02)**
	b.	Write Dirichlet problem for a Circle.	**(02)**
	c.	Write the general form of equation for which the method of changing variable $u = \log x, v = \log y$ can apply.	**(02)**
	d.	$u = x^2 - y^2$ is solution of two dimension Laplace equation. State whether the statement is true or false?	**(01)**
Q-5		**Attempt all questions**	**(14)**
	a.	In usual notation, prove that $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$.	**(07)**
	b.	Using Monge's method, solve the equation $x\,(r + 2xs + x^2 t) = p + 2x^3$.	**(07)**
		OR	
Q-5		**Attempt all questions**	**(14)**
	a.	Classify and Reduce the equation $r^2 + y^2 t = y$ to canonical form.	**(07)**
	b.	State and prove Harnack's theorem.	**(07)**
Q-6		**Attempt all questions**	**(14)**
	a.	Using Monge's method, solve the equation $r - t = 0$.	**(07)**
	b.	Show that the solution of three dimensional wave equation $\nabla^2 u = \left(\frac{1}{c^2}\right)\left(\frac{\partial^2 u}{\partial t^2}\right)$ can be put in the form $e^{\pm i(lx+my+nz+kct)}$,provided$k^2 = l^2 + m^2 + n^2$.	**(07)**
		OR	
Q-6		**Attempt all Questions**	
	a.	Using Monge's method, solve the equation $3r + 4s + t + (rt - s^2) = 1$.	**(07)**
	b.	Find general solution of heat equation $\frac{\partial^2 u}{\partial x^2} = \frac{1}{k}\frac{\partial u}{\partial t}$ by the method of separation of variables.	**(07)**