Sanjay Ghodawat University, Kolhapur 2017-18

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

FY M Sc.	**School of Science**	**Semester II**
MTS ~~509~~ 510	**Partial Differential Equations**	**Max Marks: 100**
May/June 2018	**End Semester Examination (ESE)**	**Time: 3 Hrs.**

2 June 2018

Instructions for Students: 1) All questions are compulsory

10:30 Am to 1:30 pm.

Q1 Choose correct alternative for the following questions — Marks, COs

a) Solution of $p^2+q^2=x+y$ is........ — 2, CO1

a. $z=(a+x)^{3/2}+\frac{3}{2}(y-a)^{3/2}+b$

b. $z=\frac{2}{3}(a+x)^{3/2}+\frac{2}{3}(y-a)^{3/2}+b$

c. $z=\frac{3}{2}(a+x)^{3/2}+\frac{3}{2}(y-a)^{3/2}+b$

d. None of these

b) A. The solution of ordinary differential equation of order n have n arbitrary constants — 2, CO1

B. The solution of partial differential equation of order n has n arbitrary functions

a. A is true, B is false b. A is false, B is true

c. Both A and B are true d. Both A and B are false

c) The relation $z=(x+a)(y+b)$ represents the partial differential equation ..... — 2, CO2

a. $z=\frac{p}{q}$ b. $z=pq$

c. $z=p-q$ d. none of these

d) A solution of $u_{xx}=0$ is of the form...... — 2, CO3

a) $u=\int f(y)dx+\phi(y)$ b) $u=\int(f'(y)dy+f(y)dx)$

c) $u=\int f(y)dx$ d) $u=\int(f(x)dx+f(y)dy)$

e) The heat equation is..... — 2, CO4

a) $\frac{\partial u}{\partial x}=c^2\nabla^2x^2$ b) $\frac{\partial u}{\partial y}=\frac{\nabla^2t^2}{c^2}$

c) $\frac{\partial u}{\partial t}=c^2\nabla^2u$ d) $\frac{\partial u}{\partial t}=c^2\nabla^2y^2$

f) The differential equation $f_{xx}+2f_{xy}+4f_{yy}=0$ is classified as — 2, CO3

a) Hyperbolic b) Parabolic
c)Elliptic d) None of these

Q2		Attempt any two of the following		
	a)	By a suitable change of independent variables, show that a second order p.d.e $Rr+Ss+Tt+g(x,y,x,u_x,u_y)=0$ can be reduced to one of the canonical form on the basis of $S^2-4RT=0$	10	CO3
	b)	By separable variable method, find the solution equation $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial x^2}, 0<x<l, t>0$ satisfying the conditions $u(0,t)=0, u(l,t)=0,\ t>0$ and $u(x,o)=f(x), 0<x<l$	10	CO4
	c)	Solve $\nabla^2 u=0, 0\le x\le a, 0\le y\le b$, subject to the boundary condition $u_x(0,y)=u_x(a,y)=0, u_y(x,0)=0, u_y(x,b)=f(x)$	10	CO5
Q3		Attempt any two of the following		
	a)	Find the complete integrals by charpits method $(p^2+q^2)y-qz=0$	8	CO2
	b)	Find the condition that a one parameter family of surfaces form a family of equipotential surfaces	8	CO4
	c)	Solve $\nabla^2 u=0, r<a$ subject to the boundary condition $\frac{\partial u}{\partial n}=\frac{\partial u}{\partial n}=f(\theta)\, on\ r=a$ where $\int_0^{2\pi} f(\theta)d\theta=0$	8	CO5
Q4		Attempt any two of the following		
	a)	Find the direction cosines of the tangent of the curve $x=x(s), y=y(s), z=z(s)$ where s is arc length of the curve measured from the fixed point P_0 on the curve to any point P on the curve are $\left(\frac{dx}{ds},\frac{dy}{ds},\frac{dz}{ds}\right)$	6	CO1
	b)	Solve the equations by Jacobi's method $z^2+zu_z-u_x^2-u_y^2=0$	6	CO2
	c)	Write short note on classification of second order p.d.e and its canonical forms.	6	CO3
Q5		Attempt any three of the following		
	a)	Find the direction cosines of the normal to the surface S of the form $z=f(x,y)$	4	CO1

b)	Obtain the partial differential equation of first order by elimination arbitrary constants from the relation $(x-a)^2+(y-b)^2+z^2=1$	4	CO1
c)	Write short note on types of some standard types of first order differential equations	4	CO2
d)	Prove that the solution of the Dirichlet problem , if it exists, is unique	4	CO5

Q6 Attempt any four of the following

a)	Show that following Pfaffian differential equations are integrable and hence find its corresponding integral. $(y^2+yz)dx+(xz+z^2)dy+(y^2-xy)dz=0$	7	CO1
b)	Describe the charpit's method of a solving a first order partial differential equations f(x,y,z,p,q)=0	7	CO2
c)	Reduce the equations to Canonical form $x^2u_{xx}-y^2u_{yy}=0$	7	CO3
d)	Show that the following surfaces form a family of equipotential surfaces and find general form of the corresponding potential function $(x^2+y^2)^2-2a^2(x^2+y^2)+a^4=c$	7	CO4
e)	Stability Theorem :Show that the solution of the Dirichlet problem is stable	7	CO5

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