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Y—115—2019

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

MATHEMATICS

(Partial Differential Equation-XI)

(MCQ + Theory)

(Friday, 20-12-2019) **Time : 2.00 p.m. to 4.00 p.m.**

Time— Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Use only black ball point pen for first question.

(*iii*) Darken only one circle for most correct answer of each MCQ.

(*iv*) Negative marking system is applicable for first question.

(MCQ)

1. Choose most *correct* answer of the following : 1 each

(*i*) Partial differential coefficient ....is denoted by 's'

(*a*) $\frac{\partial^2 z}{\partial x^2}$ (*b*) $\frac{\partial^2 z}{\partial y^2}$

(*c*) $\frac{\partial^2 z}{\partial x \partial y}$ (*d*) $\frac{\partial z}{\partial y}$

(*ii*) From the partial differential equation of the function :

$$z = f(x^2 - y^2)$$

(*a*) $xq + yp = 0$ (*b*) $xq - yp = 0$

(*c*) $xp - yq = 0$ (*d*) $xp + yq = 0$

(*iii*) In the method of multipliers l, m, n are chosen in such a way that :

(*a*) $l\text{P} + m\text{Q} + n\text{R} > 0$ (*b*) $l\text{P} + m\text{Q} + n\text{R} = 0$

(*c*) $l\text{P} + m\text{Q} + n\text{R} < 0$ (*d*) None of these

P.T.O.

(*iv*) In partial differential equation, the equation of type $f(z, p, q) = 0$, then equation requires :

(*a*) Not containing x and y (*b*) containing x only

(*c*) containing y only (*d*) containing x and y.

(*v*) An equation of type

$$a_0 \frac{\partial^n z}{\partial x^n} + a_1 \frac{\partial^n z}{\partial x^{n-1} \partial y} + \dots\dots\dots + a_n \frac{\partial^n z}{\partial y^n} = F(x, y)$$

is called ....

(*a*) Partial differential equation with constant coefficient.

(*b*) nth order partial differential equation.

(*c*) Homogeneous linear partial differential equation.

(*d*) All of the above

(*vi*) The complementary function of $2\frac{\partial^2 z}{\partial x^2} + 5\frac{\partial^2 z}{\partial x \partial y} + 2\frac{\partial^2 z}{\partial y^2} = 0$ is :

(*a*) $z = f_1(2y - x) + f_2(y - 2x)$ (*b*) $z = f_1(y + 2x) + f_2(y - 2x)$

(*c*) $z = f_1(y - 2x) + f_1(x + y)$ (*d*) $z = f_1(y + ½x) + f_1(y - 2x)$

(*vii*) Order of a partial differential equation is .... as that of the order differential coefficient into it.

(*a*) same (*b*) greater than

(*c*) less than (*d*) all of the above

(*viii*) The particular integral of partial differential equation $f(D, D') = \sin(ax + by)$ is :

(*a*) $\frac{\sin(ax+by)}{f(-a^2, -ab, b^2)}$ (*b*) $\frac{\sin(ax+by)}{f(-a^2, -ab, -b^2)}$

(*c*) $\frac{\cos(ax+by)}{f(-a^2, -ab, b^2)}$ (*d*) $\frac{\cos(ax+by)}{f(a^2, ab, b^2)}$

(*ix*) The equation of type $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ is called :

(*a*) Radio equation

(*b*) Wave equation

(*c*) Two-dimensional heat flow equation

(*d*) One-dimensional heat flow equation

(*x*) The solution of wave equation is obtained by using ....method.

(*a*) D' Almbert's (*b*) Lagrange's

(*c*) Charpit's (*d*) Euler's

(Theory)

2. Attempt any *two* of the following : 5 each

(*a*) Form a partial differential equation from :

$$x^2 + y^2 = (z - c)^2 \tan^2\alpha$$

(*b*) Explain in detail the method of solving Lagrange's equation.

(*c*) Solve :

$$(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$$

where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$.

3. Attempt any *two* of the following : 5 each

(*a*) Explain the rules for finding the particular integral of partial differential equation :

$$f(D, D) = F(x, y)$$

when :

(*i*) $F(x, y) = e^{ax+by}$

(*ii*) $F(x, y) = \cos(ax + by)$.

P.T.O.

(*b*) Solve :

$$p^2 - q^2 = 1$$

where $p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$.

(*c*) Find the general integral of the equation :

$$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = x - y$$

4. Attempt any *two* of the following : 5 each

(*a*) Solve the wave equation :

$$\frac{\partial^2 y}{\partial t^2} = c^2 \frac{\partial^2 y}{\partial x^2}$$

by D'Almbert's method.

(*b*) Use the method of separation of variables to the solve equation :

$$\frac{\partial^2 v}{\partial x^2} = \frac{\partial v}{\partial t}$$

given that $v = 0$ when $t \to \infty$, as well as $v = 0$ as $x = 0$ and $x = l$.

(*c*) Solve :

$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = 0$ which satisfies the conditions :

$u(0, y) = u(l, y) = u(x, 0) = 0$ and $u(x, a) = \sin \frac{n\pi x}{l}$.