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AO—86—2018

FACULTY OF SCIENCE

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

MARCH/APRIL, 2018

(CBCS/CGPA)

MATHEMATICS

Paper XI

(Partial Differential Equations)

(MCQ & Theory)

(Saturday, 31-03-2018) **Time : 2.00 p.m. to 4.00 p.m.**

Time—2 *Hours* *Maximum Marks*—40

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

(*ii*) Use only black 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 : 10

(*i*) The partial differential coefficient .... is denoted by S.

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

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

(*ii*) Partial differential equation is formed by eliminating arbitrary................

(*a*) Variables (*b*) Constants

(*c*) Functions (*d*) Both (*b*) and (*c*)

(*iii*) For finding the solution of partial differential equation we first write its .... equation.

(*a*) Simple (*b*) Auxiliary

(*c*) Lagrange's (*d*) None of these

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

(*a*) $lx + my + nz < 0$ (*b*) $lx + my + nz = 0$

(*c*) $lx + my + nz > 0$ (*d*) None of these

(*v*) In Charpit's method z depends on x and y and dz is given by :

(*a*) $\frac{\partial z}{\partial x} dx + \frac{\partial z}{\partial y} dy + c$ (*b*) $\frac{\partial z}{\partial x} dx - \frac{\partial z}{\partial y} dy$

(*c*) $\frac{\partial z}{\partial x} dx + \frac{\partial z}{\partial y} dy$ (*d*) None of these

(*vi*) The axuiliary equation of $(D^3 - 4D^2D' + 3DD^{2'})z = 0$ is :

(*a*) $m^4 - 4m^3 + 3m^2 = 0$ (*b*) $m^2 - 4m + 3 = 0$

(*c*) $m^3 - 4m^2 + 3m = 0$ (*d*) None of these

(*vii*) The particular integral of the partial differential equation $f(D, D')z = F(x, y)$ is given by :

(*a*) $\frac{F(x, y)}{f(D, D')}$ (*b*) $\frac{f(x, y)}{f(D, D')}$

(*c*) $\frac{F(x, y)}{f(x, y)}$ (*d*) None of these

(*viii*) Equations of the type $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ are called :

(*a*) Laplace equations (*b*) Wave equations

(*c*) One-dimensional heat flow (*d*) None of these

(*ix*) Laplace equation in polar co-ordinates is given by :

(*a*) $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} < 0$ (*b*) $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r} \frac{\partial u}{\partial r} + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0$

(*c*) $\frac{\partial^2 u}{\partial r^2} - \frac{1}{r} \frac{\partial u}{\partial r} - \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0$ (*d*) None of these (*x*) For two-dimensional heat flow equation in steady state temperature $u(x, y)$:

(*a*) changes with time t (*b*) does not change with time t

(*c*) changes with x (*d*) none of these

Theory

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

(*a*) Explain any *one* method of forming partial differential equation with suitable example.

(*b*) Solve : $y^2p - xyq = x(z - 2y)$.

(*c*) Find the general solution of $x(z^2 - y^2)\frac{\partial z}{\partial x} + y(x^2 - z^2)\frac{\partial z}{\partial y} = z(y^2 - x^2)$.

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

(*a*) Find the solution of $3\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + 4\frac{\partial^2 z}{\partial y^2} + 5\frac{\partial z}{\partial x} + \frac{\partial z}{\partial y} + z = 0$.

(*b*) Solve : $p(1 + q) = qz$.

(*c*) Solve : $\frac{\partial^3 z}{\partial x^3} - 3\frac{\partial^3 z}{\partial x^2 \partial y} + 4\frac{\partial^3 z}{\partial y^3} = e^{x + 2y}$.

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

(*a*) Explain the D'Almbert's method for solving the wave equation :

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

(*b*) Find the solution of $\frac{\partial^2 u}{\partial x^2} = h^2 \frac{\partial u}{\partial t}$.

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

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

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