School of Basic and Applied Sciences

Mathematics

ETE - Jun 2023

Time : 3 Hours **Marks : 50**

Sem II - MSCM203 - Partial Differential Equations

Your answer should be specific to the question asked

Draw neat labeled diagrams wherever necessary

1.	Write Charpit's auxiliary equations to solve the following equation: $(p+q^2)y = z.$	K2 CO1 (2)
2.	Write Charpit's auxiliary equations to solve the following equation: $(p^2+p+q)y = qz.$	K2 CO1 (2)
3.	Classify whether the following PDE is linear, quasi-linear or nonlinear: $(a)\ zz_x + 2xyz_y = 0; \quad (b)\ z_x^2 - zz_y = 0.$	K1 CO1 (2)
4.	Classify the following equations into hyperbolic, elliptic or parabolic type. (A) $8u_{xx} + u_{yy} - u_x + [\log(2+x^2)]u = 0.$ (B) $xu_{xx} + u_y = 0.$	K2 CO1 (2)
5.	Write auxiliary equations associated with Jacobi method to solve first-order PDE of the form $f(x, y, z, u_x, u_y, u_z) = 0.$	K1 CO1 (2)
6.	Reduce the equation $u_{xx} = x^2 u_{yy}$ to its canonical form.	K3 CO2 (5)
7.	Reduce the equation $u_{xx} - x^2 u_{yy} = 0$ to its canonical form.	K3 CO2 (5)
8.	Solve $(mz - ny)p + (nx - lz)q = ly - mx.$	K4 CO3 (6)
9.	Solve the following IBVP: $u_t = 4u_{xx}, \quad 0 \le x \le \pi, \quad t > 0,$ $u(0,t) = u(\pi,t) = 0, \quad t > 0,$ $u(x,0) = 3\sin 2x - 6\sin 5x, \quad 0 \le x \le \pi.$	K3 CO3 (8)
10.	Derive the D'Alembert solution to the IVP: $u_{tt} = c^2 u_{xx}, \quad -\infty < x < \infty, \quad t \ge 0,$ $u(x,0) = f(x),$ $u_t(x,0) = g(x).$	K4 CO4 (8)
11.	Solve the following BVP: $u_{xx} + u_{yy} = 0, \quad 0 < x < 1, \quad 0 < y < 1,$ $u(x,0) = x(x-1), \quad u(x,1) = 0, \quad 0 \le x \le 1,$ $u(0,y) = 0, \quad u(1,y) = 0, \quad 0 \le y \le 1.$	K4 CO4 (8)