Avinashilingam Institute for Home Science and Higher Education for Women
Deemed to be University Estd. u/s 3 of UGC Act 1956, Category 'A' by MHRD (now MoE)
Re-accredited with 'A++' Grade by NAAC. CGPA 3.65/4, Category I by UGC
Coimbatore - 641 043, Tamil Nadu, India

Continuous Internal Assessment Test I – February - 2025

Semester – II

Class : I PG **Time: 2Hrs**
Major: Mathematics **Max.Marks:60**

23MMAC09 Partial Differential Equations

Course Outcomes:

CO1:solve linear and non-linear partial differential equations of first order and second order.
CO2:determine special types of first order equations.
CO3:find the solution of Hyperbolic equations.
CO4:apply the Dirichlet and Neumann boundary value problems in scientific fields.
CO5:solve various real life problems by formulating them into partial differential equations

PART A **6 x 1 = 6**

Choose the Correct Answer

1. All integral surfaces of the equation Pp+Qq=R are generated by the integral curves of the equation --------. CO1K1
   a. F(u,v)=0 b. $\frac{dx}{P}=\frac{dy}{Q}$ c. $\frac{dx}{P}=\frac{dy}{Q}=\frac{dz}{R}$ d. $\frac{dy}{Q}=\frac{dz}{R}$
2. The integral of a two parameter system of surfaces $f(x,y,z,a,\phi(a))=0$ is called -------- CO1K2
   a. singular integral b. general integral
   c. complete integral d. particular integral
3. If a characteristic strip contains at least one integral element of $F(x,y,z,p,q)=0$ it is an integral strip of the equation -------- CO1K2
   a. $F(x,y,z,z_x,z_p)=0$ b. $F(x,y,z,z_y,z_q)=0$
   c. $F(x,y,z,z_p,z_q)=0$ d. $F(x,y,z,z_x,z_y)=0$
4. The necessary and sufficient condition for two partial differential equations f and g to be compatible is CO2K2
   a. $J\neq 0,[f,g]=0$ b. $J\neq 0,[f,g]\neq 0$
   c. $J=0,[f,g]=0$ d. $J=0,[f,g]\neq 0$
5. A complete integral of the equation pq=1 is CO2K2
   a. $z=ax-ay+b$ b. $z=ax+ay+b$ c. $z=ax+y/a+b$ d. $z=ax+by+c$
6. If u is the complementary function and v a particular integral of a linear partial differential equation, then the general solution of the equation is CO3K2
   a. u+v b. u*v c. u/v d. v/u

Part-B **3 x 6= 18**

Answer ALL the questions

7. a. Find the general integral of the linear partial differential equation
   $px(x+y)=qy(x+y)-(x-y)(2x+2y+z).$ CO1K3

(or)

7. b.Find the equation of the integral surface of the differential equation $2y(z-3)p+(2x-z)q = y(2x-3).$ CO1K3

8. a. Find the complete integral of the equations $z^2 = pqxy$ by charpit's method. CO2K2

(or)

8. b. Find the complete integral of the equations $zpq = p+q.$ CO2K3

9. a. Find the solution of the equation $\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = x - y.$ CO3K3

(or)

9. b. Reduce the equation $\frac{\partial^2 z}{\partial x^2} = x^2 \frac{\partial^2 z}{\partial y^2}$ to canonical form. CO2K4

Part-C **3 x 12 = 36**

Answer ALL the questions

10. a. If $u_i(x_1, x_2, \ldots, x_n, z) = c_i \, (i = 1,2,\ldots,n)$ are independent solutions of the equations $\frac{dx_1}{P_1} = \frac{dx_2}{P_2} = \frac{dx_3}{P_3} = \ldots = \frac{dz}{R}$, then prove that the relation $\phi(u_1, u_2, \ldots, u_n) = 0$ in which the function ϕ is arbitrary, is a general solution of the linear partial differential equation $P_1 \frac{\partial z}{\partial x_1} = P_2 \frac{\partial z}{\partial x_2} = P_3 \frac{\partial z}{\partial x_3} = \ldots = P_n \frac{\partial z}{\partial x_n} = R.$ CO1K3

(or)

10. b. Find the solution of the equation $z = \frac{1}{2}(p^2+q^2) + (p-x)(q-y)$ which passes through the x axis. CO1K4

11. a. Show that the only integral surface of the equation $2q(z-px-qy) = 1+q^2$ which is circumscribed about the paraboloid $2x = y^2+z^2$ is the enveloping cylinder which touches it along its section by the plane $y+1=0.$ CO1K3

(or)

11. b. Find a complete integral of the partial differential equation $(p^2+q^2)x = pz$ and deduce the solution which passes through the curve $x=0, z^2 = 4y.$ CO2K3

12. a. Solve the equation $(D^2 - D')z = 2y - x^2$ CO2K3

(or)

12. b. (i) If $u_1, u_2, \ldots, u_n$ are solutions of the homogeneous linear partial differential equation $F(D,D')z = 0$, then prove that $\sum_{r=1}^{n} c_r u_r$, where c_r's are arbitrary constants, is also a solution. CO3K3

(ii) Explain reducible and irreducible of F(D,D'). Show that if the operator F(D,D') is reducible, then the order in which the linear factors occur is unimportant.

CO3K3

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