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Total Number of Pages: 02

Course: M.Sc.I
Sub_Code: FMCC603

6th Semester Regular Examination: 2024-25

SUBJECT: DIFFERENTIAL EQUATION-II

BRANCH(S): M.Sc.I(MC)

Time: 3 Hours

Max Marks: 70

Q.Code: S190

Answer Question No.1 (Part-I) which is compulsory, any five from rest (Part-II)
The figures in the right hand margin indicate marks.

Part-I

Q1 Answer the following questions : (2 x 10)

- Find the Green's function for the boundary value problem $y'' = 0; y(0) = 0, y'(1) = 0$.
- Write the general form of a second-order self-adjoint differential equation?
- Write two properties of Green's function.
- What is the condition of integrability of the Pfaffian differential equation $P(x, y, z)dx + Q(x, y, z)dy + R(x, y, z)dz = 0$?
- Define quasi-linear partial differential equation.
- Form a partial differential equation from the equation $u = f(x - y)$.
- Find the general solution of the partial differential equation $xp + yq = z$.
- Find the general solution of $u_{xy} = 0$.
- Show that if u is the complementary function and z_1 is particular integral of a linear partial differential equation, then $u + z_1$ is a general solution of the equation.
- Solve the differential equation $(D^2 - D^2)z = 0$.

Part-II

Long Answer Type Questions (Answer Any five)

- Q2 a) Find the eigenvalues and eigen functions of the following Sturm-Liouville problem (5 + 5)
 $y'' + \lambda y = 0; y(0) = 0, y(\pi) = 0$.
- b) Solve the differential equation $\frac{dx}{x(y-z)} = \frac{dy}{y(z-x)} = \frac{dz}{z(x-y)}$.
- Q3 a) Verify that the differential equation $(ydx + xdy)(1-z) + xydz = 0$ is integrable and find its (5 + 5)
primitives.
- b) Solve the boundary value problem $y'' + 4y = e^x; y(0) = 0, y'(\pi) = 0$ using appropriate Green's function.

- Q4** a) Solve the differential equation $\frac{dx}{\cos(x+y)} = \frac{dy}{\sin(x+y)} = \frac{dz}{z}$. (5 + 5)
- b) Find the complete integral, $z^2 = pqxy$.
- Q5** a) Show that a family of spheres $x^2 + y^2 + (z-c)^2 = r^2$ satisfies the first order linear partial differential equation $yp - xq = 0$. (5 + 5)
- b) Find the general solution of the first order linear partial differential equation $xu_x + yu_y = u$.
- Q6** a) Obtain the general solution of the linear Euler partial differential equation $xu_x + yu_y = nu$. (5 + 5)
- b) Find the complete integral of the partial differential equation $(p^2 + q^2)y = qz$.
- Q7** a) Solve the following partial differential equations (5 + 5)
- $(D - D' - 1)(D + D' - 2)z = 0$
- b) $(D - 2D' + 5)(D^2 + D' + 3)z = 0$.
- Q8** a) Reduce the equation $xyr - (x^2 - y^2)s - xyt + py - qx = 2(x^2 - y^2)$ to canonical form. (5 + 5)
- b) Solve the differential equation $r - t = 0$ by Monge's method.