V57/S24042/EE/20170722

Time : 3 Hours **Marks : 80**

Instructions :

1. All Questions are Compulsory.
2. Each Sub-question carry 5 marks.
3. Each Sub-question should be answered between 75 to 100 words. Write every questions answer on separate page.
4. Question paper of 80 Marks, it will be converted in to your programme structure marks.

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1. Solve any **four** sub-questions.

   a) Obtain the partial differential equation of first order by eliminating arbitrary constants from the relation $(x-a)^2+(y-b)^2+z^2=1$. 5

   b) Eliminate the arbitrary function from the following equation and find corresponding partial differential equation $z = xy + F(x^2+y^2)$. 5

   c) Prove that the singular integral is also a solution of the first order partial differential equation. 5

   d) Find the general integral of 5

   $$z(xp-yq) = y^2 - x^2$$

   e) Find the general integral of 5

   $$(x^3+3xy^2)p+(y^3+3x^2y)q = 2(x^2+y^2)z$$

2. Solve any **four** sub-questions.

   a) Solve 5

   $$(6x+yz)dx+(xz-2y)dy+(xy+2z)dz=0$$

   b) Derive necessary and sufficient condition for the two partial differential equations $f(x, y, z, p, q)=0$ and $g(x, y, z, p, q)=0$ to be compatible. 5

   c) Describe Charpit's method of solving a first order partial differential equation $f(x, y, z, p, q)=0$. 5

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d) Find the complete integral of $z^2 - pqxy = 0$ by Charpit's method. 5

e) Find the complete integral of the PDE 5

$$z(p^2 + q^2) + px + qy = 0$$

3. Solve any **four** sub-questions.

a) Describe a method to solve PDE of the type $f(z, p, q) = 0$. 5

b) Describe Jacobi's method to solve the first order partial differential equation of the form $f(x, y, z, u_x, u_y, u_z) = 0$. 5

c) Solve the equation $z^2 - u_x^2 - u_y^2 + zu_z = 0$. 5

d) Discuss how a general solution may be used to determine the integral surface which passes through a given curve. 5

e) Find the integral of $z = p^2 - q^2$ which passes through the curve

$4z + x^2 = 0,\ y = 0$. 5

4. Solve any **four** sub-questions.

a) Reduce the equation $u_{xx} + x^2\ u_{yy} = 0$ to canonical form. 5

b) Derive Laplace equation. 5

c) Prove that the solution of the Dirichlet problem, if it exists, is unique. 5

d) State and prove Stability theorem. 5

e) State and prove Harnack's theorem. 5

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