Fakir Mohan Autonomous College, Balasore

UG II Year, CC - paper- VII

July 20, 2021

Questions carrying one mark each :-

1. Define an partial differential equation.

2. Give an example of semi linear PDE.

3. Give an example of non linear PDE.

4. Give an example of a function whose partial derivative exists but function is not differentiable.

5. State Lagrange's equation for quasi linear PDE.

6. Solve $u_x = 0$.

7. Define Laplace's equation for two variable.

8. Give an example of a heat equation.

9. Give an example of a wave equation.

10. State Cauchy problem for quasi linear PDE.

11. Give an example of PDE which has no solution,

12. What is complete solution for $f(x, y, z, p, q) = 0$.

13. What is particular solution for $f(x, y, z, p, q) = 0$.

14. Which type of PDE we can solve by using Charpit's method.

15. How many number of independent variable are there in a system of ODE.

Questions carrying two mark each :-

16. Find the PDE corresponding to
$$z = x + ax^2y^2 + b$$
.

17. Form a PDE for all planes having y and z intercepts form.

18. Formulate the PDE for
$$z = f(xe^y) + g(y^2 \cos y)$$
.

19. Find the general solution of $p + z^2q = 0$ passing through $x = 1, y = z$.

20. How many solution are there for the PDE $p + q = 1$ with initial condition (t, t, t).

21. Find the singular solution of $z = ax + \frac{y}{a} + b$.

22. State Charpit's method for $f(x, y, z, p, q) = 0$.

23. Given $z_{xx} = z_{yy}$, which type of PDE is this ?

24. Given an example of parabolic PDE.

25. Solve $z_{xx} + 6z_{xy} + 9z_{yy} = 0$.

26. Use matrix notation to write down 2×2 system given by

$$x_1' = x_1 - x_2$$
$$x_2' = -x_1 + x_2.$$

27. Give an example of homogeneous system of ODE which has no solution.

28. Determin the nature of the critical point $(0, 0)$ of the system

$$\frac{dx}{dt} = 2x + 4y$$
$$\frac{dy}{dt} = -2x + 6y.$$

29. Give an example of non-linear system of ODE's.

30. Convert the second order ODE $y'' + y = 0$ to a system of ODE.

Subjective Questions :

31. Find the general solution to the system of ODE given by :

$$\frac{dx}{dt}(t) = x + 3y$$
$$\frac{dy}{dt}(t) = 3x + y.$$

32. Draw the phase portrait of the given system of ODE :

$$\frac{dx}{dt}(t) = 2x + 4y$$
$$\frac{dy}{dt}(t) = -2x + 6y.$$

33. Convert the PDE to a canonical form : $3u_{xx} + 103u_{xy} + 3u_{yy} = 0$.

34. Solve the following PDE :
$$(D^2 - 4DD' + 4D'^2)u = e^{2x+y}.$$

35. Consider $u_t = u_{xx}$, $0 < x < 1$, $t > 0$

$$u(x, 0) = \sin x$$
$$u_x(0, t) = 0, u_x(1, t) = 0$$

Solve this.

36. Solve

$$u_{tt} = 4u_{xx}, \ -\infty < x < \infty, \ t > 0$$
$$u(x,0) = sin(x), u_t(x,0) = e^x.$$

37. The characteristic curve of the PDE $2yu_x + (2x + y^2)u_y = 0$ passing through (0,0) is ?

38. Solve the PDE , $p^2 + q^2 = 1, \ z(x,y) = 0$ on $x + y = 1$.

39. Find the complete solution of $(p^2 + q^2)y - qz = 0$.

40. Show that $xp - yq = 0$ and $z(xp) = 2xy - zyq$ are compatible.

.... Good Luck ....