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15512

Fifth Semester B.Sc. Degree Examination, May/June 2016
MATHEMATICS – X
Paper – 5.2 : Differential Equations – II

Time : 3 Hours

Max. Marks : 80

***Instruction :** Answer all the Sections.*

SECTION – A

Answer **any ten** of the following. **(10x2=20)**

1. Show that $P_n(1) = 1$.
2. Define Legendre differential equation and write down the series solution of it.
3. If f(x) is a polynomial of degree less than 'm', show that $\int_{-1}^{1} f(x) P_m(x)\,dx = 0$
4. Show that $J_{1/2}(x) = \sqrt{\frac{2}{\Pi x}}\ \text{Sin}x$.
5. Show that $J_2 = J_0'' - \frac{1}{x} J_0'$.
6. Varify the condition for integrability $3x^2dx + 3y^2dy - (x^3 + y^3 + e^{2z})\,dz = 0$.
7. Solve $yzdx - 2xzdy + (xy - zy^3)dz = 0$.
8. Solve $\frac{dx}{z^2y} = \frac{dy}{z^2x} = \frac{dz}{xy^2}$.
9. Form the partial differential equation from $2z = \frac{x^2}{a^2} + \frac{y^2}{b^2}$.
10. Solve $p^2 + q^2 = 1$.
11. Solve $pq = 1$.
12. Define Clairaut's equation and solve

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

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SECTION – B

Answer any five of the following. **(5x6=30)**

13. Prove that $nP_n(x) = x\,P_n'(x) - P_{n-1}'(x)$.

14. Prove that $\int_{-1}^{1} P_m(x)P_n(x)\,dx = \begin{cases} 0 & \text{If } m \neq n; \\ \dfrac{2}{2n+1} & \text{If } m = n \end{cases}$

15. Show that $2n\,J_n(x) = x\,[J_{n+1}(x) + J_{n-1}(x)]$.

16. Show that $\int J_3(x)\,dx = -J_2(x) - \dfrac{2}{x}J_1(x)$.

17. Show that $x^n J_n(x)$ is a solution of $xy'' + (1-2n)y' + xy = 0$.

18. Solve, $(yz + 2x)dx + (zx - 2z)dy + (xy - 2y)dz = 0$.

19. Solve, $\dfrac{dx}{y^2 + yz + z^2} = \dfrac{dy}{z^2 + zx + x^2} = \dfrac{dz}{x^2 + xy + y^2}$.

SECTION – C

Answer **any five** of the following. **(5x6=30)**

20. Form the partial differential equation given that $f(x + y + z,\ x^2 + y^2 - z^2) = 0$.

21. Solve : $z^2\left(\dfrac{p^2}{x^2} + \dfrac{q^2}{y^2}\right) = 1$.

22. Solve : $p(1 - q^2) = q(1 - z)$.

23. Solve : $yp = 2yx + \log q$.

24. Obtain the complete Integral and Singular solution of the equation $z = px + qy + \log pq$.

25. Find the complete solution of $pxy + pq + qy = yz$ by Charpit's method.

26. Find the complete solution of $(p^2 + q^2)y = qz$. Charpits method.

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