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SVS 339 B - 15
B.Sc. Vth Semester Degree Examination
Mathematics
(Differential Equation - II)
Paper : 5.2

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer **all** the sections

I. Answer **any ten** questions. Each question carries **2 marks.** **(10×2=20)**

1. Using generating function for Legendre's polynomials $p_n(x)$ Prove that $P_n(-x)=(-1)^n P_n(x)$
2. Show that $J_o'(x)=-J_1(x)$
3. Show that $J_{-1/2}(x)=\sqrt{\frac{2}{\pi x}}.\cos x$
4. From recurrence relation show that $J_2(x)=J_0''(x)-\frac{1}{x}J_0'(x)$
5. Show that $\int_a^b x.J_0(ax)dx=\frac{b}{a}J_1(x)$
6. Verify the condition for Integrability of the equation $yzdx-2xzdy+(xy-zy^3)dz=0$
7. Solve $\frac{xdx}{y^2z}=\frac{dy}{xz}=\frac{dz}{yz}$
8. Define partial differential equation and give one example of first order.
9. Form the Partial differential equation by eliminating arbitrary constants a & c from $x^2+y^2+(z-c)^2=a^2$
10. Solve $xp+yq=z$
11. Solve p+q=pq
12. Find the complete Integral of $pe^y=qe^x$.

SECTION - B

II. Answer any **FIVE** **(5×6=30)**

1. Prove that $p_n(x) = \frac{1}{2^n n!}\frac{d^n}{dx^n}(x^2-1)^n$.

2. Expand $f(x) = x^4$ in a series of Legendre polynomial of the form $\sum_{n=0}^{\infty} C_r P_r(x)$.

3. using recurrence relation $\frac{d}{dx}\left[x^n J_n(x)\right] = x^n . J_{n-1}(x)$

4. Using recurrence relation show that $J_n(x) = \frac{x}{2n}\left[J_{n-1}(x) + J_{n+1}(x)\right]$.

5. Verify the condition for Integrability and solve the equation. $(y^2+yz)dx + (xz+z^2)dy + (y^2-xy)dz = 0$

6. Solve $\frac{dx}{z(x+y)} = \frac{dy}{z(x-y)} = \frac{dz}{x^2+y^2}$

7. Solve $\frac{dx}{z} = \frac{dy}{-z} = \frac{dz}{z^2+(x+y)^2}$

SECTION - C

III. Answer any **Five** **(5×6=30)**

1. Form the partial differential equation by eliminating arbitrary function f & g from

   $$z = \frac{1}{y}[f(x+ay) + g(x-ay)]$$

2. Solve the Lagrange's equation $(x^2-yz)p+(y^2-zx)q=z^2-xy$
3. Solve $z^2(p^2x^2+q^2)=1$
4. Solve $x^2p^2 + y^2q^2 = z^2$
5. Solve $(p^2+q^2)z = x^2 - y^2$
6. Find the complete Integral of $P^2x + q^2y = z$ by charpits method.
7. Find the complete Integral of px+qy+pq=0 by charpits method.
