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S. Y. B. Sc. (A. T. K. T.) (Sem. - III) Examination

March - 2023

Mathematics - VII : MTH - 303

Time: 1 Hours] **[Total Marks: 50**

સૂચના : / Instructions

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **S. Y. B. Sc. (A. T. K. T.) (Sem. - III)**

Name of the Subject :

☛ **Mathematics - VII : MTH - 303**

Subject Code No.: **2103000203023003**

Seat No.:

Student's Signature

(2) There are two sections in the question paper A and B having total 33 questions.
(3) There is only one correct answer for each question.
(4) Follow usual notations and conventions.
(5) Question number 1 to 16, each is of 1 mark.
(6) Question number 17 to 33, each is of 2 marks.

***O.M.R. Sheet* ભરવા અંગેની અગત્યની સૂચનાઓ આપેલ**
***O.M.R. Sheet*ની પાછળ છાપેલ છે.**
Important instructions to fillup O.M.R. Sheet
are given on back side of the provided O.M.R. Sheet.

SECTION - A 16

(Question number 1 to 16, each is of 1 mark)

Q. 1. A complete solution of the partial differential equation $z = px + qy + pq$ is _____.

(A) $z = ax + by$ (C) $z = axy + b$

(B) $z = x + y + ab$ (D) $z = ax + by + ab$

Q. 2. A partial differential equation by eliminating F from $z = y^2 + F(\frac{1}{x} + \log y)$ is _____.

(A) $x^2p + qy = 2y^2$ (C) $xp^2 + y^2q = 2y$

(B) $xp + yq = 2y$ (D) None of these

Q. 3. The known integral of the differential equation $x\frac{d^2y}{dx^2} - (x + 1)\frac{dy}{dx} + y = x^2e^{2x}$ is _____.

(A) e^{-x} (C) e^{x}

(B) x (D) x^2

Q. 4. The Particular Integral of differential equation $\frac{d^2y}{dx^2} + 4y = \sin 3x + e^x$ is _____.

(A) $-\frac{1}{5}\sin 3x + \frac{1}{5}e^x$ (C) $\frac{1}{5}\sin 3x + \frac{1}{5}e^x$

(B) $\frac{1}{5}\cos 3x + \frac{1}{5}e^x$ (D) $-\frac{1}{5}\cos 3x + \frac{1}{5}e^x$

Q. 5. The general solution of differential equation $(D^2 - 1)y = 4xe^x$ where $D = \frac{d}{dx}$ is _____.

(A) $Ae^x + Be^{-x} + xe^x$ (C) $(A + Bx)e^x + xe^x$

(B) $(A + Bx)e^x + x + x^2$ (D) $Ae^x + Be^{-x} + x + x^2$

Q. 6. Order of the partial differential equation $4\frac{\partial^3}{\partial x^2 \partial y} + 3x\frac{\partial z}{\partial y} + 3xy = 0$ is _____.

(A) 4 (C) 2

(B) 3 (D) 1

Q. 7. The known integral of the differential equation $x\frac{d^2y}{dx^2} + (2-x)\frac{dy}{dx} - y = 2\cos x$ is _____.

(A) x^{-1} (C) e^{-x}

(B) x (D) e^{x}

Q. 8. Order of the partial differential equation $\frac{\partial^2 z}{\partial x \partial y} - 3x^3\frac{\partial z}{\partial y} + xy = 0$ is _____.

(A) 4 (C) 2

(B) 3 (D) 1

Q. 9. A partial differential equation by eliminating F from $z = F(x^2 + y^2)$ is _____.

(A) $yp - xq = 0$ (C) $xp + yq = 0$

(B) $yp + xq = 1$ (D) $yq + xp = 1$

Q. 10. Which of the following is not linear?

(A) $px + qy = 4$ (C) $(x + 2z)p + (4zx - y)q = 2x^2 + y$

(B) $xzp + yzq = xy$ (D) None of these

Q. 11. A partial differential equation by eliminating ϕ from $z = e^{my}\phi(x - y)$ is _____.

(A) $pq = mz$ (C) $p + q = mz$

(B) $p = q + mz$ (D) None of these

Q. 12. The C.F. of differential equation $(D^3 + D^2 - D - 1)\, y = \cos 2x$ is _____.

(A) $Ae^{x} + Be^{-x} + Ce^{-x}$ (C) $Ae^{-x} + Be^{x} + Ce^{-x}$

(B) $Ae^{-x} + Be^{x} + Cxe^{-x}$ (D) $Ae^{-x} + Be^{x} + Cxe^{x}$

Q. 13. The known integral of the differential equation $\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = x$ is _____.

(A) e^{x} (C) x

(B) x^2 (D) e^{-x}

Q. 14. Order of the partial differential equation $\frac{\partial^2 y}{\partial x \partial y} + \frac{\partial z}{\partial x} = 2x$ is _____.

(A) 2 (C) 3

(B) 1 (D) 4

Q. 15. A partial differential equation by eliminating a and b from $z = a(x + y) + b$ is _____.

(A) $p + q = c$ (C) $pq = c$

(B) $p = q$ (D) None of these

Q. 16. A partial differential equation by eliminating h and k from $z = (x - h)^2 + (y - k)^2 + z^2 = c^2$ is _____.

(A) $p^2 + q^2 + 1 = z^2$ (C) $z^2(p^2 + q^2 + 1) = c^2$

(B) $z^2(p^2 + q^2) = c$ (D) $z^2(p + q + 1) = c$

SECTION - B 34

(Question number 17 to 33, each is of 2 marks)

Q. 17. The general solution of differential equation $(2x - 1)^2 \frac{d^2y}{dx^2} + (2x - 1)\frac{dy}{dx} - 2y = 0$ is _____.

(A) $(2x - 1)\left[c_1(2x - 1)^{-\frac{\sqrt{3}}{2}} + c_2(2x - 1)^{\frac{\sqrt{3}}{2}}\right]$

(B) $(2x - 1)\left[c_1 + c_2(2x - 1)^{\frac{\sqrt{3}}{2}} + c_3(2x - 1)^{-\frac{\sqrt{3}}{2}}\right]$

(C) $(2x - 1)\left[(c_1 + c_2x)(2x - 1)^{\frac{\sqrt{3}}{2}} + c_3(2x - 1)^{-\frac{\sqrt{3}}{2}}\right]$

(D) $(2x - 1)\left[(c_1 + c_2x)(2x - 1)^{-\frac{\sqrt{3}}{2}} + c_3(2x - 1)^{\frac{\sqrt{3}}{2}}\right]$

Q. 18. The general solution of differential equation $[x^6D^2 + 3x^5D + a^2]y = 0$,where $D = \frac{d}{dx}$ by transforming the independent variable x to z is _____.

(A) $c_1 \cos\frac{a}{x^2} + c_2 \sin\frac{a}{x^2}$ (C) $c_1 \cos\frac{a}{2x^2} - c_2 \sin\frac{a}{2x^2}$

(B) $c_1 \cos\frac{a}{x^2} - c_2 \sin\frac{a}{x^2}$ (D) $c_1 \cos\frac{a}{2x^2} + c_2 \sin\frac{a}{2x^2}$

Q. 19. Solution of the partial differential equation $q - p + x - y = 0$ is _____.

(A) $z = (x + a) + (y + a)^2 + b$ (C) $2z = (x + a) + (y + b)$

(B) $2z = (x + a)^2 + (y + a)^2 + b$ (D) None of these

Q. 20. Solution of the partial differential equation $x^2p^2 = yq^2$ is _____.

(A) $z = \log y + cx + a$ (C) $z = c\sqrt{x} + 2c \log y + a$

(B) $z = c \log x + 2c\sqrt{y} + a$ (D) None of these

Q. 21. The general solution of differential equation $(D^2 - (a + b)D + ab)y = e^{ax} + e^{bx}$; $D = \frac{d}{dx}$ is _____.

(A) $Ae^{ax} + Be^{bx} + \frac{e^{ax}}{(a-b)} + \frac{e^{bx}}{(b-a)}$

(B) $Ae^{ax} + Be^{bx} + \frac{e^{ax}}{(b-a)} + \frac{e^{bx}}{(a-b)}$

(C) $Ae^{ax} + Be^{bx} + \frac{xe^{ax}}{(b-a)} + \frac{xe^{bx}}{(a-b)}$

(D) $Ae^{ax} + Be^{bx} + \frac{xe^{ax}}{(a-b)} + \frac{xe^{bx}}{(b-a)}$

Q. 22. Solution of the partial differential equation

$x(y^n - z^n)p + y(z^n - x^n)q = z(x^n - y^n)$ is _____.

(A) $f(xyz, x^n + y^n + z^n) = 0$ (C) $f(x^n y^n z^n, x + y + z) = 0$

(B) $f(x + y + z, xyz) = 0$ (D) None of these

Q. 23. The general solution of differential equation $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$ is _____.

(A) $Ax + Bx^2 + \frac{e^x}{x^2}$ (C) $Ax^{-1} + Bx^{-2} + \frac{e^x}{x^2}$

(B) $Ax + Bx^2 + x^2e^x$ (D) $Ax^{-1} + Bx^{-2} + x^2e^x$

Q. 24. Solution of a partial differential equation $p(1 + qr) = q(z - a)$ is _____.

(A) $2a\sqrt{az - a^2 - 1} = x + by + c$

(B) $2a\sqrt{a - a^2 - 1} = x - by + c$

(C) $2a\sqrt{az - a^2z - 1} = bx + a + c$

(D) None of these

Q. 25. Solution of partial differential equation $p + q = pq$ is _____.

(A) $z = ax + (a-1)y + b$

(C) $z = (a-1)x + ay + b$

(B) $z = ax + \frac{a}{a-1}y + b$

(D) None of these

Q. 26. The C.F. of differential equation $x^3\frac{d^3y}{dx^3} + 3x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$ is _____.

(A) $y = c_1e^x + e^{\frac{x}{2}}[\text{A}\cos(\frac{\sqrt{3}}{2}\log x) + \text{B}\sin(\frac{\sqrt{3}}{2}\log x)]$

(B) $y = c_1e^{-1} + x^{\frac{1}{2}}[\text{A}\cos(\frac{\sqrt{3}}{2}\log x) + \text{B}\sin(\frac{\sqrt{3}}{2}\log x)]$

(C) $y = c_1e^{-x} + e^{\frac{x}{2}}[\text{A}\cos(\frac{\sqrt{3}}{2}\log x) + \text{B}\sin(\frac{\sqrt{3}}{2}\log x)]$

(D) $y = c_1x + x^{\frac{1}{2}}[\text{A}\cos(\frac{\sqrt{3}}{2}\log x) + \text{B}\sin(\frac{\sqrt{3}}{2}\log x)]$

Q. 27. The general solution of differential equation $\frac{d^2y}{dx^2} + \frac{2}{x}\frac{dy}{dx} - n^2y = 0$ is _____.

(A) $\frac{1}{x}(c_1e^{nx} + c_2e^{-nx})$

(C) $\frac{1}{x}(c_1 + c_2x)e^{nx}$

(B) $x(c_1e^{nx} + c_2e^{-nx})$

(D) $x(c_1 + c_2x)e^{nx}$

Q. 28. A partial differential equation by eliminating a and b from $z = (x + a)(y + b)$ is _____.

(A) $z = p + q$

(C) $z = pq$

(B) $z = \frac{p}{q}$

(D) $z = p - q$

Q. 29. Solution of partial differential equation $(x + 2z)p + (4zx - y)q = 2x^2 + y$ is _____.

(A) $f(xy - z, x - y - z) = 0$

(C) $f(xyz, x + y + z) = 0$

(B) $f(xy + z^2, x^2 + y + z) = 0$

(D) $f(xy - z^2, x^2 - y - z) = 0$

Q. 30. The general solution of differential equation $x\frac{d}{dx}(x\frac{dy}{dx} - y) - 2x\frac{dy}{dx} + 2y = -x^2y$ using method of the removal of the first derivative is _____.

(A) $(c_1 \cos x + c_2 \sin x)e^x$ (C) $(c_1 \cos x + c_2 \sin x)e^{x^2}$

(B) $(c_1 \cos x + c_2 \sin x)x$ (D) $(c_1 \cos x + c_2 \sin x)x^2$

Q. 31. Solution of the partial differential equation $\sqrt{p} + \sqrt{q} = 1$ is _____.

(A) $z = ax + (1 - a)y + c$ (C) $z = ax + y + c$

(B) $z = ax + (1 - a^2)y + c$ (D) $z = ax + (1 - \sqrt{a})^2 y + c$

Q. 32. The general solution of differential equation $x^2\frac{d^2y}{dx^2} - 2x(1 + x)\frac{dy}{dx} + 2(1 + x)y = 0$ is _____.

(A) $c_1 + c_2xe^{2x}$ (C) $c_1x + c_2xe^{2x}$

(B) $c_1x + c_2x^2e^{2x}$ (D) $c_1 + c_2x^2e^{2x}$

Q. 33. A partial differential equation by eliminating "F" from $Z = e^{mx} F(x + y)$ is _____.

(A) $p - q = mz$ (C) $p - q = z$

(B) $p + q = mz^2$ (D) $m(p + q) = z$

_____

SPACE FOR ROUGH WORK