



RAN - 2103000203023003

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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.:

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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. Sheetની પાછળ છાપેલ છે.***

***Important instructions to fillup O.M.R. Sheet  
are given on back side of the provided O.M.R. Sheet.***

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

- Q. 1. 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. 2. 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. 3. 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. 4. 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. 5. 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)  $z^2(p + q + 1) = c$
- Q. 6. 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. 7. 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. 8.** 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. 9.** 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. 10.** 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. 11.** 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. 12.** 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. 13.** 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. 14.** 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. 15.** 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. 16.** A partial differential equation by eliminating  $\phi$  from  $z = e^{my} \phi(x - y)$  is \_\_\_\_\_.  
 (A)  $pq = mz$  (C)  $p + q = mz$   
 (B)  $p = q + mz$  (D) None of these

**SECTION - B**

**34**

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

- Q. 17.** 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)  $y = c_1 e^x + e^{\frac{x}{2}} [A \cos(\frac{\sqrt{3}}{2} \log x) + B \sin(\frac{\sqrt{3}}{2} \log x)]$   
 (B)  $y = c_1 e^{-1} + x^{\frac{1}{2}} [A \cos(\frac{\sqrt{3}}{2} \log x) + B \sin(\frac{\sqrt{3}}{2} \log x)]$   
 (C)  $y = c_1 e^{-x} + e^{\frac{x}{2}} [A \cos(\frac{\sqrt{3}}{2} \log x) + B \sin(\frac{\sqrt{3}}{2} \log x)]$   
 (D)  $y = c_1 x + x^{\frac{1}{2}} [A \cos(\frac{\sqrt{3}}{2} \log x) + B \sin(\frac{\sqrt{3}}{2} \log x)]$
- Q. 18.** The general solution of differential equation  $\frac{d^2y}{dx^2} + \frac{2}{x} \frac{dy}{dx} - n^2 y = 0$  is \_\_\_\_\_.  
 (A)  $\frac{1}{x}(c_1 e^{nx} + c_2 e^{-nx})$  (C)  $\frac{1}{x}(c_1 + c_2 x)e^{nx}$   
 (B)  $x(c_1 e^{nx} + c_2 e^{-nx})$  (D)  $x(c_1 + c_2 x)e^{nx}$
- Q. 19.** 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. 20.** 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. 21.** 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. 22.** 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)  $z = ax + (1 - \sqrt{a})^2y + c$

**Q. 23.** The general solution of differential equation

$$x^2 \frac{d^2y}{dx^2} - 2x(1+x) \frac{dy}{dx} + 2(1+x)y = 0 \text{ is } \underline{\hspace{2cm}}.$$

- (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. 24.** 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)  $m(p + q) = z$

**Q. 25.** The general solution of differential equation

$$(2x - 1)^2 \frac{d^2y}{dx^2} + (2x - 1) \frac{dy}{dx} - 2y = 0 \text{ is } \underline{\hspace{2cm}}.$$

- (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. 26.** 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. 27.** 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. 28.** 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. 29.** 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. 30.** 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. 31.** 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. 32.** 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. 33.** 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

**SPACE FOR ROUGH WORK**