Department of Mathematics

E-content for B.A./B.Sc. Semester II, Paper I, Unit III (Part B)

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Multiple Choice Questions

1. The differential equation of the family of curves $y = mx$ is
   a. $x\frac{dy}{dx} - y = 0$
   b. $\frac{dy}{dx} = x$
   c. $\frac{d^2y}{dx^2} = 0$
   d. $\frac{dy}{dx} = m$
2. The differential equation of the family of curves $y = mx + c$ is
   a. $\frac{dy}{dx} = m$
   b. $\frac{d^2y}{dx^2} = 0$
   c. $\frac{d^2y}{dx^2} = c$
   d. none of these
3. The differential equation of the family of curves $y^2 = 4ax$ is
   a. $\frac{dy}{dx} - \frac{y}{2x} = 0$
   b. $\frac{dy}{dx} + \frac{y}{2x} = 0$
   c. $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - y = 0$
   d. none of these
4. The solution of the differential equation $y(1+x)dx + x(1+y)dy = 0$ is
   a. $y(1+x) + x(1+y) = 0$
   b. $y(1+x) + x(1+y) = c$
   c. $x + y + \log(xy) = c$
   d. $x + y + logx + logy = 0$
5. The solution of the differential equation $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$ is
   a. $\sec^2 x \tan y + \sec^2 y \tan x = 0$
   b. $\tan x \tan y = 0$
   c. $\tan x + \tan y = c$
   d. $\tan x \tan y = c$
6. The solution of the differential equation $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$ is
   a. $e^y = e^x + \frac{x^3}{3} + c$
   b. $e^x = e^y + \frac{y^3}{3} + c$

c. $e^x = e^y + \frac{x^3}{3}$ + c

d. $y = e^x + \frac{x^3}{3} + c$

7. The differential equation (x + y) dy + (x - y) dx = 0 is
   a. homogeneous
   b. non-homogeneous
   c. reducible to homogeneous
   d. none of these
8. The differential equation $2\frac{dy}{dx} = \frac{y}{x} + \frac{y^2}{x^2}$ is
   a. non-homogeneous
   b. homogeneous
   c. reducible to homogeneous
   d. none of these
9. The solution of the differential equation $(2x + y + 1)\ dx + (4x + 2y - 1)dy = 0$ is
   a. $2x + y + \log(2x + y + 1) = c$
   b. $x + 2y + \log(2x + y + 1) = c$
   c. $2x + y + \log(2x + y - 1) = c$
   d. $x + 2y + \log(2x + y - 1) = c$
10. The integrating factor of the differential equation $(x\ logx)\ \frac{dy}{dx}$ + y = 2 log x is
    a. x log x
    b. 2 log x
    c. log x
    d. log2x
11. The integrating factor of differential equation $(x + 2y^3)dy = ydx$ is
    a. $\frac{1}{y}$
    b. y
    c. x
    d. $\frac{1}{x}$

12. The solution of the differential equation $(x + 2y^3)dy = ydx$ is
    a. $x + 2y^3 = c$
    b. $x = y^3 + cy$
    c. $y = x + 2y^3 + c$
    d. none of these
13. The solution of the differential equation ydx+xdy=0 is
    a. $y + x = c$
    b. $logx.logy = c$
    c. $xy = c$
    d. $\frac{1}{x} + \frac{1}{y} = c$
14. The integrating factor of the differential equation $\frac{dy}{dx} + Py = Q\ is$
    a. $e^{\int Pdx}$

b. $e^{-\int Pdx}$
c. $e^{\int Qdx}$
d. $e^{-\int Qdx}$

15. The differential equation $x\frac{dy}{dx} + y = y^2 logx$ is
    a. linear
    b. reducible to linear
    c. exact
    d. partial differential equation
16. The integrating factor of the differential equation $(x^2 - 1)\frac{dy}{dx} + 2xy = 1\ is$
    a. $x^2 - 1$
    b. $2x$
    c. $\frac{1}{x^2-1}$
    d. $\frac{2x}{x^2-1}$
17. The solution of the differential equation $(e^y + 1)\cos x + e^y \sin x \frac{dy}{dx} = 0$ is
    a. $(e^y + 1)\cos x = c$
    b. $(e^y + 1)\sin x = c$
    c. $e^y \sin x = c$
    d. $e^y \cos x = c$
18. The integrating factor of the differential equation $(1 + y^2)dx = (\tan^{-1} y - x)dy\ is$
    a. $e^{\tan^{-1} x}$
    b. $e^{\sec x}$
    c. $\tan^{-1} y$
    d. $e^{\tan^{-1} y}$
19. The integrating factor of the differential equation $\frac{dy}{dx} + y\sec x = \tan x$ is
    a. $\sec x + \tan x$
    b. $e^{\sec x + \tan x}$
    c. $\cos x + \cot x$
    d. $e^{\cos x}$
20. The integrating factor of the differential equation $\frac{dy}{dx} + y\cot x = 2\cos x$ is
    a. $\cos x$
    b. $\cot x$
    c. $log \sin x$
    d. $\sin x$

Answers

1. a (eliminate m between $y = mx$ and $\frac{dy}{dx} = m$)
2. b (differentiate $y = mx + c$ twice)
3. a (eliminate a between $y^2 = 4ax \; and \; y\frac{dy}{dx} = 2a$)
4. c $y(1+x)dx + x(1+y)dy = 0 \; or \frac{1+x}{x}dx + \frac{1+y}{y}dy = 0 \; or \; logx + x + logy + y = c$
   or $x + y + logxy = c$
5. d $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$ or $\frac{\sec^2 x}{\tan x}dx + \frac{\sec^2 y}{\tan y}dy = 0$
   or $logtanx + logtany = logc$ or $\tan x \tan y = c$
6. a $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y} \; or \; \frac{dy}{dx} = e^x e^{-y} + x^2 e^{-y} = (e^x + x^2)e^{-y}$
   or $e^y dy = (e^x + x^2)dx$ or $e^y = e^x + \frac{x^3}{3} + c$
7. a (x + y) dy + (x - y) $dx = 0$ or $\frac{dy}{dx} = \frac{y-x}{x+y}$
8. b $2\frac{dy}{dx} = \frac{y}{x} + \frac{y^2}{x^2} \; or \; \frac{dy}{dx} = \frac{xy+y^2}{2x^2}$
9. d $(2x + y + 1)\, dx + (4x + 2y - 1)dy = 0$
   Put $2x + y = v$, $\frac{dv}{dx} = \frac{3v-3}{2v-1}$ or $\left(2 + \frac{1}{v-1}\right)dv = 3dx$
   or $2v + \log(v - 1) = 3x + c$
   or $x + 2y + \log(2x + y - 1) = c$
10. c $(x \; logx)\, \frac{dy}{dx}$ + y = 2 log x or $\frac{dy}{dx} + \frac{1}{x \; logx}y = \frac{2}{x}$ which is a linear differential equation
    I.F.=$e^{\int \frac{1}{xlogx}dx}$ =$e^{\log(logx)}$= log x

11. a $(x + 2y^3)dy = ydx \; or \; \frac{dx}{dy} - \frac{x}{y} = 2y^2 \; Linear$
    I.F.=$e^{-\int \frac{1}{y}dy}$=$e^{-logy} = \frac{1}{y}$
12. b $(x + 2y^3)dy = ydx$ Linear I.F.=$\frac{1}{y}$, Solution : $x\frac{1}{y} = \int 2y^2.\frac{1}{y}dy = \int 2ydy = y^2 + c$
    or $x = y^3 + cy$
13. c ydx + xdy=0 or $\frac{1}{x}\, dx + \frac{1}{y}\, dy = 0$
    or $\log x + \log y = \log c$ or $xy = c$
14. a
15. b
16. a $(x^2 - 1)\frac{dy}{dx} + 2xy = 1$ or $\frac{dy}{dx} + \frac{2xy}{x^2-1} = \frac{1}{x^2-1}$ Linear
    I.F.=$e^{\int \frac{2x}{x^2-1}dx}$ =$e^{\log(x^2-1)} = x^2 - 1$

17. b $(e^y + 1)\cos x + e^y \sin x \frac{dy}{dx} = 0$,
    $Since \frac{\partial[(e^y+1)\cos x]}{\partial y} = e^y \cos x \; and \; \frac{\partial[e^y \sin x]}{\partial x} = e^y \cos x$
    therefore $\frac{\partial[(e^y+1)\cos x]}{\partial y} = \frac{\partial[e^y \sin x]}{\partial x}$ and so the differential equation is exact.

Solution: $(e^y + 1)\sin x = c$

18. d $(1 + y^2)dx = (\tan^{-1} y - x)dy$ or $\frac{dx}{dy} + \frac{x}{1+y^2} = \frac{\tan^{-1} y}{1+y^2}$ linear

    I.F.=$e^{\int \frac{1}{1+y^2} dy} = e^{\tan^{-1} y}$

19. a $\frac{dy}{dx} + y\sec x = \tan x$ linear

    I.F. = $e^{\int \sec x}\, dx = e^{\log(\sec x + \tan x)}$=$\sec x + \tan x$

20. d $\frac{dy}{dx} + y\cot x = 2\cos x$ linear

    I.F.=$e^{\int \cot x dx}$= $e^{log \sin x}$ =$\sin x$

For any clarifications or discussions, you may contact me at 9415462800 directly or through Whatsapp.

References:

1. A text book of Matrices & Differential Equations: Prakashan Kendra
2. Matrices, vectors & Differential Equations: Krishna Prakashan