SRM INSTITUTE OF SCIENCE AND TECHNOLOGY RAMAPURAM CAMPUS DEPARTMENT OF MATHEMATICS CONTINUOUS ASSESSMENT TEST – 2

* Required

Answer ALL Questions

Each question carries ONE mark.

1. *

If u and v are functionally dependent, then their Jacobian value is
(A) zero (B) one (C) not equal to zero (D) greater than zero

- ○ A
- ◉ B
- ○ C
- ○ D

2. *

If $rt - s^2 < 0$ at a point (a, b) for the function $f(x, y)$ where

$r = \dfrac{\partial^2 f}{\partial x^2}, s = \dfrac{\partial^2 f}{\partial x \partial y}, t = \dfrac{\partial^2 f}{\partial y^2}$, then the point (a, b) is said to be ________.

(A) maximum point (B) minimum point

(C) saddle point (D) fixed point

- A
- B
- C (selected)
- D

3. *

If $z = x^2 + y^2 + 3xy$, then $\dfrac{\partial z}{\partial x} =$

(A) $2y + 3x$ (B) $3y$ (C) $2x + 3y$ (D) $2x$

- A
- B
- C (selected)
- D

4. *

$u = \sin^{-1}\left(\frac{x^2 + y^2}{x - y}\right)$ is a homogeneous function of degree

(A) 2 (B) 3 (C) 1 (D) 4

- ○ A
- ○ B
- ◉ C
- ○ D

5. *

If $f(x, y)$ is an implicit function, then $\frac{dy}{dx} =$

(A) $-\frac{\frac{\partial f}{\partial x}}{\frac{\partial f}{\partial y}}$ (B) $\frac{\frac{\partial f}{\partial x}}{\frac{\partial f}{\partial y}}$ (C) $\frac{\frac{\partial f}{\partial y}}{\frac{\partial f}{\partial x}}$ (D) $-\frac{\frac{\partial f}{\partial y}}{\frac{\partial f}{\partial x}}$

- ◉ A
- ○ B
- ○ C
- ○ D

6. *

If $x = r\cos\theta$ and $y = r\sin\theta$, then $\dfrac{\partial(x, y)}{\partial(r, \theta)} =$

(A) r (B) r^2 (C) $2r$ (D) $1/r$

- (●) A
- ( ) B
- ( ) C
- ( ) D

7. *

If u is a homogeneous function of degree n, then $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} =$

(A) 0 (B) n u (C) u (D) n^2 u

- ( ) A
- (●) B
- ( ) C
- ( ) D

8. *

If $x = u^2 - v^2$ and $y = 2uv$, then $\dfrac{\partial(x, y)}{\partial(u, v)} =$
(A) $u^2 + v^2$ (B) $2(u^2 + v^2)$ (C) $4(u^2 + v^2)$ (D) $4v^2$

- ○ A
- ○ B
- ◉ C
- ○ D

9. *

If $J_1 = J\left(\dfrac{x, y}{r, \theta}\right)$ and $J_2 = J\left(\dfrac{r, \theta}{x, y}\right)$, then $J_1 J_2 =$
(A) 0 (B) -1 (C) 2 (D) 1

- ○ A
- ○ B
- ○ C
- ◉ D

10. *

If $f(x, y) = x^2 + y^2$, then the function f has ________ value at the point $(0, 0)$.

(A) maximum (B) minimum
(C) neither maximum nor minimum (D) no

- ( ) A
- (•) B
- ( ) C
- ( ) D

11. *

If $f(x, y) = e^x \sin y$, then $f_x(0,0) =$

(A) 1 (B) 2π (C) -1 (D) 0

- ( ) A
- ( ) B
- ( ) C
- (•) D

12. *

If $f(x,y)=\cos x\cos y$, then $f_{yy}(0,0)=$
(A) -1 (B) 0 (C) 2 (D) 1

- (•) A
- ( ) B
- ( ) C
- ( ) D

13. *

If $z=e^{x}\log y$, then $\frac{\partial z}{\partial y}=$
(A) $\frac{1}{y}$ (B) $-\frac{e^{x}}{y^{2}}$ (C) e^{x} (D) $\frac{e^{x}}{y}$

- ( ) A
- ( ) B
- ( ) C
- (•) D

14. *

If $f(x, y) = e^x \cos y$, then $f_{xy}(0,0) =$

(A) 0 (B) – 1 (C) 2 (D) 1

- (●) A
- ( ) B
- ( ) C
- ( ) D

15. *

If $u = ax^2 + by^2 + 2hxy$, then $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} =$

(A) u (B) $2u$ (C) $3u$ (D) $4u$

- ( ) A
- (●) B
- ( ) C
- ( ) D

16. *

If $f(x,y)=e^{xy}$, then $f_{yy}(1,1)=$
(A) $-e$ (B) $\frac{1}{e}$ (C) e (D) $-\frac{1}{e}$

- ○ A
- ○ B
- ◉ C
- ○ D

17. *

Saddle points are the points at which the function has _________ value.	
(A) minimum	(B) maximum
(C) neither minimum nor maximum	(D) equal

- ○ A
- ○ B
- ◉ C
- ○ D

18. *

If $u = x / y$, then $x \dfrac{\partial u}{\partial x} + y \dfrac{\partial u}{\partial y} =$
(A) 2 u (B) 3 u (C) 4 u (D) 0 u

- ○ A
- ○ B
- ○ C
- ◉ D

19. *

If u and v are functions of two independent variables x and y, then $\dfrac{\partial(u, v)}{\partial(x, y)} =$
(A) $\begin{vmatrix} u_x & v_x \\ u_y & v_y \end{vmatrix}$ (B) $\begin{vmatrix} -u_x & u_y \\ v_x & v_y \end{vmatrix}$ (C) $\begin{vmatrix} -u_x & u_y \\ v_x & -v_y \end{vmatrix}$ (D) $\begin{vmatrix} -u_x & v_x \\ u_y & v_y \end{vmatrix}$

- ◉ A
- ○ B
- ○ C
- ○ D

20. *

Lagrange's method of undetermined multipliers is used to find the maximum or minimum value of a function of ___________.

(A) two variables (B) three or more variables

(C) one variable (D) continuous variables

- ( ) A
- (•) B
- ( ) C
- ( ) D

21. *

If $r = \frac{\partial^2 f}{\partial x^2}, s = \frac{\partial^2 f}{\partial x \partial y}, t = \frac{\partial^2 f}{\partial x^2}$, then the condition for a function $f(x, y)$ to have a minimum value is that

(A) $rt - s^2 \neq 0$ (B) $rt - s^2 > 0, r > 0$ or $t > 0$

(C) $rt - s^2 > 0, r < 0$ or $t < 0$ (D) $rt - s^2 = 0, r > 0$

- ( ) A
- ( ) B
- (•) C
- ( ) D

22. *

The necessary conditions for $f(x, y)$ to have a maximum or a minimum value at (a, b) are

(A) $f_x(a, b) = 0, f_y(a, b) = 0$ (B) $f_{xx}(a, b) = 0$
(C) $f_{yy}(a, b) = 0$ (D) $f_{xx}(a, b) = 0, f_{yy}(a, b) = 0$

- (●) A
- ( ) B
- ( ) C
- ( ) D

23. *

If $u = x^2 + y^2$ where $x = e^t$, $y = t^2$, then $\frac{du}{dt} =$

(A) $2e^{2t} + 4t^3$ (B) $e^t + 4t^3$ (C) $e^{2t} + 4t$ (D) $e^{2t} + t^4$

- (●) A
- ( ) B
- ( ) C
- ( ) D

24. *

If $u = 2x^2 + 3y^2 + 4x - 6y$, then the stationary point is ____________.			
(A) (3,4)	(B) (3,2)	(C) (– 1 ,1)	(D) (1, –1)

- [ ] A
- [ ] B
- [x] C
- [ ] D

25. *

If $f(x, y) = \log(x^2 + y^2)$, then $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} =$			
(A) 1	(B) 2	(C) 0	(D) 4

- [ ] A
- [x] B
- [ ] C
- [ ] D

26. *

The solution of $(D^3 - D^2 + D - 1)\, y = 0$ is
(A) $y = A\, e^{x} + B \cos x + C \sin x$ (B) $y = A\, e^{-x} + B \cos x + C \sin x$ (C) $y = A\, e^{x} + B \cosh x + C \sinh x$ (D) $y = A\, e^{-x} + B \cosh x + C \sinh x$

- (selected) A
- B
- C
- D

27. *

The complementary function of $(D^2 + D + 1)\, y = 0$ is	
(A) $e^{\frac{1}{2x}}\left(C_1 \cos\frac{\sqrt{3}}{2}x + C_2 \sin\frac{\sqrt{3}}{2}x\right)$	(B) -1 , 2
(C) $e^{\frac{-1}{2}x}\left(C_1 \cos\frac{\sqrt{3}}{2}x + C_2 \sin\frac{\sqrt{3}}{2}x\right)$	(D) $\cos x + i \sin x$

- A
- B
- (selected) C
- D

28. *

The particular integral of $(D^3 + 1)\,y = 0$ is	
(A) 0	(B) $A\,e^x + B\cos x - C\sin x$
(C) $A\cos x + B\sin x$	(D) $A\,e^x + B\cosh x + C\sinh x$

- (selected) A
- B
- C
- D

29. *

The complementary function of $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 3e^{4x}$ is	
(A) $C_1 e^{-3x} + C_2 e^{-3x}$	(B) $C_1 e^{3x} + C_2 e^{3x}$
(C) $(C_1 + C_2 x)e^{-3x}$	(D) $(C_1 + C_2 x)e^{3x}$

- A
- B
- (selected) C
- D

30. *

The particular integral of $(D^2 + 2D + 1)\,y = 5$ is			
(A) 0	(B) 5	(C) 2	(D) 1

- [ ] A
- [x] B
- [ ] C
- [ ] D

31. *

The complementary function of $(D^2 + 4)\,y = x \sin x$ is	
(A) $C_1 e^{-2x} + C_2 e^{-2x}$	(B) $C_1 e^{2x} + C_2 e^{2x}$
(C) $C_1 \cos 2x + C_2 \sin 2x$	(D) $(C_1 + C_2 x)e^{2x}$

- [ ] A
- [ ] B
- [x] C
- [ ] D

32. *

The particular integral of $(D^2 + 9)\,y = e^{-2x}$ is

(A) $\frac{e^{-2x}}{15}$ (B) $\frac{e^{2x}}{15}$ (C) $\frac{e^{-2x}}{13}$ (D) $\frac{e^{-2x}}{14}$

- ( ) A
- ( ) B
- (•) C
- ( ) D

33. *

The complementary function of $(D - 1)^2\, y = e^{-x}$ is

(A) $C_1\, e^{-x} + C_2\, e^{-x}$ (B) $C_1\, e^{x} + C_2\, e^{x}$

(C) $(C_1 + C_2\, x)e^{x}$ (D) $(C_1 + C_2\, x)e^{-x}$

- ( ) A
- ( ) B
- (•) C
- ( ) D

34. *

The particular integral of $(D-1)^2\, y = e^x$ is
(A) $\frac{x}{32}e^{-x}$ (B) $\frac{x^2}{2}e^{x}$ (C) $\frac{x}{16}e^{-x}$ (D) $\frac{1}{16}e^{-x}$

- ( ) A
- (•) B
- ( ) C
- ( ) D

35. *

The solution of $(D^2 + 5D + 6)\, y = 0$ is	
(A) $y = C_1 e^{-2x} + C_2 e^{-3x}$	(B) $y = C_1 e^{2x} + C_2 e^{-3x}$
(C) $y = C_1 e^{-2x} + C_2 e^{3x}$	(D) $y = C_1 e^{2x} + C_2 e^{3x}$

- (•) A
- ( ) B
- ( ) C
- ( ) D

36. *

The complementary function of $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} + 15y = 0$ is

(A) $C_1 e^{-5x} + C_2 e^{-3x}$ (B) $C_1 e^{4x} + C_2 e^{4x}$

(C) $C_1 e^{5x} + C_2 e^{3x}$ (D) $C_1 e^{2x} + C_2 e^{6x}$

- ○ A
- ○ B
- ◉ C
- ○ D

37. *

The particular integral of $(D^2 + 9)\,y = \sin 3x$ is

(A) $\frac{x}{2}\sin x$ (B) $\frac{-x}{2}\sin x$ (C) $\frac{-x}{6}\cos 3x$ (D) $\frac{x}{6}\cos 3x$

- ○ A
- ○ B
- ◉ C
- ○ D

38. *

If the three roots of the auxiliary equation are a, then the complementary function is

(A) $C_1 e^{ax} + C_2 e^{ax} + C_3 e^{ax}$ (B) $C_1 e^{-ax} + C_2 e^{-ax} + C_3 e^{-ax}$
(C) $(C_1 + C_2 x) e^{ax}$ (D) $(C_1 + C_2 x + C_3 x^2) e^{ax}$

- ○ A
- ○ B
- ○ C
- ◉ D

39. *

The particular integral of $(D^2 + 1)\, y = \cos x$ is

(A) $\frac{x}{2} \sin x$ (B) $\frac{-x}{3} \cos 2x$ (C) $\frac{-x}{4} \cos 2x$ (D) $\frac{x}{4} \sin 2x$

- ◉ A
- ○ B
- ○ C
- ○ D

40. *

The roots of the auxiliary equation $m^2 - 25 = 0$ are
(A) 5, 5 (B) – 5, – 5 (C) ± 5 (D) $\pm 5i$

- [ ] A
- [ ] B
- [x] C
- [ ] D

41. *

The particular integral of $(D^2 + 16)y = e^{-4x}$ is
(A) $\frac{x}{32}e^{-4x}$ (B) $\frac{1}{32}e^{-4x}$ (C) $\frac{x}{16}e^{-4x}$ (D) $\frac{1}{16}e^{-4x}$

- [ ] A
- [x] B
- [ ] C
- [ ] D

42. *

The complementary function of $(D^2 - 4)y = \sin x$ is	
(A) $C_1 e^{2x} + C_2 e^{-2x}$	(B) $C_1 e^{2x} + C_2 e^{2x}$
(C) $C_1 \cos 2x + C_2 \sin 2x$	(D) $(C_1 + C_2 x)e^{2x}$

- (•) A
- ( ) B
- ( ) C
- ( ) D

43. *

The particular integral of $(D^2 + 2)y = x^2$ is			
(A) $\frac{1}{2}x^2$	(B) $\frac{1}{2}(x^2-1)$	(C) $\frac{1}{2}(x^2+1)$	(D) $\frac{-1}{2}x^2$

- ( ) A
- (•) B
- ( ) C
- ( ) D

44. *

The equation $(a_0\, x^2\, D^2 + a_1\, x\, D + a_2)\, y = f(x)$, where a_0, a_1, a_2 are constants is called

(A) Cauchy-Euler's equation (b) Legendre's equation
(C) Taylor's equation (D) Homogeneous equation

- (selected) A
- B
- C
- D

45. *

The particular integral of $(D^2 + 1)\, y = x$ is

(A) $\frac{1}{2}x$ (B) x (C) $\frac{1}{2}(x^2+1)$ (D) $\frac{-1}{2}x^2$

- A
- (selected) B
- C
- D

46. *

In Cauchy-Euler homogeneous linear differential equation, the transformation ________ is used to convert variable coefficients into constant coefficients.

(A) $x = e^z$ (B) $x = \sin\theta$ (C) $x = \cos\theta$ (D) $x = \sec\theta$

- (●) A
- ( ) B
- ( ) C
- ( ) D

47. *

The particular integral of $(D^2 + a^2)\,y = \cos ax$ is

(A) $\frac{-x}{2a}\sin ax$ (B) $\frac{-x}{2a}\cos ax$

(C) $\frac{x}{2a}\cos ax$ (D) $\frac{x}{2a}\sin ax$

- ( ) A
- ( ) B
- ( ) C
- (●) D

48. *

If $y_1 = \cos x$, $y_2 = \sin x$, then the value of $y_1 y_2' - y_2 y_1' =$			
(A) 0	(B) 1	(C) – 1	(D) 2

- ○ A
- ◉ B
- ○ C
- ○ D

49. *

The solution of $(x^2 D^2 - 7xD + 12)y = 0$ is	
(A) $y = Ae^{-2z} + Be^{6z}$	(B) $y = Ae^{2z} + Be^{6z}$
(C) $y = Ae^{-2z} + Be^{-6z}$	(D) $y = Ae^{2z} + Be^{-6z}$

- ○ A
- ◉ B
- ○ C
- ○ D

50. *

The particular integral of $(D^2+8)\,y = \cos 3x$ is			
(A) $-\sin 3x$	(B) $-\cos 3x$	(C) $\sin 3x$	(D) $\frac{x}{9}\sin 3x$

- [ ] A
- [x] B
- [ ] C
- [ ] D

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