

CLASS : CC (Advanced) Area under the curve + Differential Equation

TEST-21

M.M.: 69

**PART-A**

Time: 60 Min

**[SINGLE CORRECT CHOICE TYPE]**Q.1 to Q.23 has four choices (A), (B), (C), (D) out of which **ONLY ONE** is correct.**[23 × 3 = 69]**

- Q.1 The area of region, in the first quadrant, bounded by the parabola  $y = 9x^2$  and the line  $x = 0, y = 1$  and  $y = 4$ , is  
 (A)  $\frac{2}{9}$  (B)  $\frac{14}{9}$  (C)  $\frac{7}{9}$  (D)  $\frac{11}{9}$
- Q.2 The area bounded by the curve  $y = \ln x$  and the lines  $y = 0, y = \ln 3$  and  $x = 0$  is equal to  
 (A) 3 (B)  $3\ln 3 - 2$  (C) 2 (D)  $3\ln 3 + 2$
- Q.3 The area under the curve  $y = |\cos x - \sin x|, 0 \leq x \leq \frac{\pi}{2}$  and above x-axis is  
 (A)  $2\sqrt{2}$  (B)  $2\sqrt{2} - 2$  (C) 0 (D)  $2\sqrt{2} + 2$
- Q.4 The equation of the curve passing through the origin and satisfying the differential equation  $(1 + x^2) \frac{dy}{dx} + 2xy = 4x^2$ , is  
 (A)  $3(1 + x^2)y = 4x^3$  (B)  $(1 + x^2)y = 3x^3$   
 (C)  $3(1 + x^2)y = 2x^3$  (D)  $(1 + x^2)y = x^3$
- Q.5 The area bounded by the curves  $y = \sqrt{x}, 2y - x + 3 = 0$ , x-axis and lying in the first quadrant is  
 (A) 36 (B) 18 (C)  $\frac{27}{4}$  (D) 9

- Q.6 The area of the region enclosed by the curves  $y = x$ ,  $x = e$ ,  $y = \frac{1}{x}$  and the positive  $x$ -axis, is
- (A)  $\frac{e^2 - 3}{2}$                       (B)  $\frac{3}{2}$                       (C)  $\frac{5}{2}$                       (D)  $\frac{1}{2}$
- Q.7 The area bounded by the curve  $y = \cos x$  and  $y = \sin x$  between the ordinates  $x = 0$  and  $x = \frac{3\pi}{2}$ , is
- (A)  $4\sqrt{2} + 2$                       (B)  $4\sqrt{2} - 1$                       (C)  $4\sqrt{2} + 1$                       (D)  $4\sqrt{2} - 2$
- Q.8 The solution of the differential equation  $\frac{dy}{dx} = \frac{x+y}{x}$  satisfying the condition  $y(1) = 1$ , is
- (A)  $y = x + \ln x$                       (B)  $y = x \ln x + x^2$                       (C)  $y = x e^{x-1}$                       (D)  $y = x \ln x + x$
- Q.9 The area of the plane region bounded by the curves  $x + 2y^2 = 0$  and  $x + 3y^2 = 1$ , is equal to
- (A)  $\frac{5}{3}$                       (B)  $\frac{1}{3}$                       (C)  $\frac{2}{3}$                       (D)  $\frac{4}{3}$
- Q.10 The area enclosed between the curve  $y = \log_e(x + e)$  and the coordinate axes is
- (A) 1                      (B) 2                      (C) 3                      (D) 4
- Q.11 The parabolas  $y^2 = 4x$  and  $x^2 = 4y$  divide the square region bounded by the lines  $x = 4$ ,  $y = 4$  and the coordinate axes. If  $S_1, S_2, S_3$  are respectively the areas of these parts numbered from top to bottom, then  $S_1 : S_2 : S_3$  is
- (A) 1 : 2 : 1                      (B) 1 : 2 : 3                      (C) 2 : 1 : 2                      (D) 1 : 1 : 1
- Q.12 The degree of the differential equation whose solution is  $y = c_1x + \sqrt{c_1}$ , is
- (A) 2                      (B) 3                      (C) 1                      (D) 0

Q.13 If  $y = c_1 e^{2x} + c_2 e^x + c_3 e^{-x}$  satisfies the differential equation  $\frac{d^3y}{dx^3} + a \frac{d^2y}{dx^2} + b \frac{dy}{dx} + cy = 0$ , then the value of  $\frac{a^3 + b^3 + c^3}{abc}$  is equal to

- (A)  $\frac{-1}{2}$                       (B)  $\frac{1}{2}$                       (C)  $\frac{-1}{4}$                       (D)  $\frac{1}{4}$

Q.14 Let  $f: \mathbb{R} \rightarrow \mathbb{R}$  and  $g: \mathbb{R} \rightarrow \mathbb{R}$  be twice differentiable functions satisfying  $f''(x) = g''(x)$ ,  $2f'(1) = g'(1) = 4$  and  $3f(2) = g(2) = 9$ . The value of  $(f(4) - g(4))$  is equal to

- (A)  $-6$                       (B)  $-16$                       (C)  $-10$                       (D)  $-8$

Q.15 The value of positive real parameter 'a' such that the area of the region bounded by the parabolas  $y = x - ax^2$ ,  $ay = x^2$  attains its maximum value is equal to

- (A)  $\frac{1}{2}$                       (B) 2                      (C) 1                      (D)  $\frac{5}{2}$

Q.16 Number of solutions of the equation  $\max(\sin \theta, \cos \theta) = \frac{1}{2}$  in  $\theta \in (-2\pi, 5\pi)$  is equal to

- (A) 3                      (B) 5                      (C) 7                      (D) 9

Q.17 If  $A(n)$  represents the area bounded by the curve  $y = n \ln x$ , where  $n \in \mathbb{N}$  and  $n > 1$ , the x-axis and the lines  $x = 1$  and  $x = e$ , then the value of  $A(n) + nA(n-1) =$

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

Q.18 Let  $f(x) = ax^2 + bx + c$ , where  $a \in \mathbb{R}^+$  and  $b^2 - 4ac < 0$ . Area bounded by  $y = f(x)$ , x-axis and the lines  $x = 0, x = 1$  is equal to

- (A)  $\frac{1}{6}(3f(1) + f(-1) + 2f(0))$                       (B)  $\frac{1}{12}(5f(1) + f(-1) + 8f(0))$   
 (C)  $\frac{1}{6}(3f(1) - f(-1) + 2f(0))$                       (D)  $\frac{1}{12}(5f(1) - f(-1) + 8f(0))$

- Q.19 A point P moves in xy plane in such a way that  $[x + y + 1] = [x]$  where  $[x]$  is the greatest integer less than or equal to x, and  $x \in (0, 2)$ . Area of the region representing all possible positions of the point P is equal to
- (A) 2                      (B) 8                      (C)  $\sqrt{2}$                       (D) 4
- Q.20 Area enclosed by the curve which is defined parametrically as  $x = \frac{1-t^2}{1+t^2}$ ,  $y = \frac{2t}{1+t^2}$  (t is parameter) is equal to
- (A)  $\pi$                       (B)  $\frac{\pi}{2}$                       (C)  $\frac{3\pi}{4}$                       (D)  $\frac{3\pi}{2}$
- Q.21 Solution of the differential equation  $\cos x \, dy = y(\sin x - y)dx$ ,  $0 < x < \frac{\pi}{2}$  is
- (A)  $y \sec x = \tan x + c$                       (B)  $y \tan x = \sec x + c$   
(C)  $\tan x = (\sec x + c)y$                       (D)  $\sec x = (\tan x + c)y$
- Q.22 If  $x \frac{dy}{dx} = y(\log y - \log x + 1)$ , then the solution of equation is
- (A)  $y \log \left( \frac{x}{y} \right) = cx$     (B)  $x \log \left( \frac{y}{x} \right) = cy$     (C)  $\log \left( \frac{y}{x} \right) = cx$     (D)  $\log \left( \frac{x}{y} \right) = cy$
- Q.23 The differential equation which represents the family of curves  $y = c_1 e^{c_2 x}$ , where  $c_1$  and  $c_2$  are arbitrary constants, is
- (A)  $y' = y^2$                       (B)  $y'' = y' y$                       (C)  $y y'' = y'$                       (D)  $y y'' = (y')^2$

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**ANSWER KEY**  
**PART-A**

Q.1	B	Q.2	C	Q.3	B	Q.4	A	Q.5	D
Q.6	B	Q.7	D	Q.8	D	Q.9	D	Q.10	A
Q.11	D	Q.12	A	Q.13	C	Q.14	C	Q.15	C
Q.16	C	Q.17	C	Q.18	D	Q.19	A	Q.20	A
Q.21	D	Q.22	C	Q.23	D				