REV-01
BSM/05/10

2023/12

B.SC. MATHEMATICS
FIRST SEMESTER
CALCULUS
BSM – 101 IDMJ
[USE OMR FOR OBJECTIVE PART]

SET A

Duration: 3 hrs. **Full Marks: 70**

(Objective)

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

1. If $f(-x)=f(x)$ $f(x)$ is said to be ,then
   a. Greatest integer function
   b. Odd function
   c. Even function
   d. range

2. Derivative of e^{2x} is
   a. e^{2x}
   b. $2e^{2x}$
   c. $e^{\cos x}$
   d. $e^{\sin x}\cos x$

3. If $f(x)=4x+5,-5\le x\le 7$,then range=?
   a. $[-15,33]$
   b. $(-15,33)$
   c. $[15,33[$
   d. $]15,33]$

4. If $f(x)=x^2$ $f'(x)=?$ then
   a. x^2
   b. x
   c. $2x$
   d. $x+1$

5. The complementary function of the differential equation $\frac{d^2y}{dx^2}-4\frac{dy}{dx}+4y=0$ is
   a. $y=c_1e^{2x}+c_2e^{2x}$
   b. $y=c_1e^{2x}+xc_2e^{2x}$
   c. $y=c_1e^{2x}-xc_2e^{2x}$
   d. $y=c_1e^{2x}-c_2e^{2x}$

6. If $f(x)=\frac{|x|}{x}$, then Range=?

a. $\{-1,-1\}$ b. $\{1,1\}$

c. $\{1,2\}$ d. $\{1,-1\}$

7. What is the domain of the function $f(x)=\frac{1}{x+5}$?

a. R b. $R-\{5\}$

c. $\{5\}$ d. $R-\{-5\}$

8. Solution of a differential equation $\frac{d^2y}{dx^2}-7\frac{dy}{dx}+12y=0$ is

a. $y=c_1e^{3x}+c_2e^{4x}$ b. $y=c_1e^{-3x}+c_2e^{4x}$

c. $y=c_1e^{-3x}+c_2e^{-4x}$ d. $y=c_1e^{3x}+c_2e^{-4x}$

9. Domain of the function $f(x)=x$ is

a. A set of real number R b. A set of intezer z

c. A null set d. A set of Rational number Q

10. $\lim_{x\to a}[f(x)g(x)]=?$

a. $\lim_{x\to a}f(x)+\lim_{x\to a}g(x)$ b. $\lim_{x\to a}f(x)\lim_{x\to a}g(x)$

c. $\lim_{x\to a}f(x)-\lim_{x\to a}g(x)$ d. None of the above

11. General solution of a linear differential equation with constant coefficient is

a. Only C.F b. $y=C.F+P.I$

c. Only P.I d. None of the above

12. A function f is said to be continuous at $x=3$ if

a. $\lim_{x\to 3^-}f(x)=\lim_{x\to 3^+}f(x)\neq f(3)$ b. $\lim_{x\to 3^-}f(x)\neq\lim_{x\to 3^+}f(x)=f(3)$

c. $\lim_{x\to 3^-}f(x)=\lim_{x\to 3^+}f(x)=f(3)$ d. None of the above

13. $\int dx = ?$

a. x
b. $x + c$
c. 0
d. None of the above

14. $\int_a^b f(x)dx = ?$

a. $-\int_b^a f(x)dx$
b. $\int_b^a f(x)dx$
c. $\int_a^c f(x)dx + \int_c^b f(x)dx$
d. None of the above

15. To find asymptote of a curve,in the highest deegre term $\phi_n(m), x = ? \, y = ?$

a. $x = -1, y = m$
b. $x = m, y = 1$
c. $x = 1, y = -m$
d. $x = 1, y = m$

16. For finding asymptotes of a curve ,the special formula for c

a. $\phi_{n-1}(m) = 0$
b. $c = \dfrac{\phi_{n-1}(m)}{\phi_n'(m)}$
c. $c = -\dfrac{\phi_{n-1}(m)}{\phi_n'(m)}$
d. $\phi'_n(m) = 0$

17. The equation of the tangent at the point (x_1, y_1) is

a. $y - y_1 = -\dfrac{1}{\left[\dfrac{dy}{dx}\right]_{(x_1,y_1)}}(x - x_1)$
b. $y - y_1 = \left[\dfrac{dy}{dx}\right]_{(x_1,y_1)}(x - x_1)$
c. $y - y_1 = \dfrac{1}{\left[\dfrac{dy}{dx}\right]_{(x_1,y_1)}}(x - x_1)$
d. $y - y_1 = \left[\dfrac{dy}{dx}\right]_{(x,y)}(x - x_1)$

18. Find the value of $\int \dfrac{\tan(\log x)}{x}dx$

a. $\log|\sec x|$
b. $\log|\sec(\log x)|$
c. $\log x$
d. $|\sec(\log x)|$

19. The equation of normal at the point $(2,3)$ is

a. $y-3=-\dfrac{1}{\left[\dfrac{dy}{dx}\right]_{(2,3)}}(x-2)$

b. $y-3=\left[\dfrac{dy}{dx}\right]_{(x\ ,y\ )}(x-2)$

c. $y-3=\dfrac{1}{\left[\dfrac{dy}{dx}\right]_{(2,3)}}(x-2)$

d. $y-3=\left[\dfrac{dy}{dx}\right]_{(2,3)}(x-2)$

20. $\int\sqrt{\sin^3 x}\cos x dx=?$

a. $\dfrac{5}{2}(\sin x)^{2/5}$

b. $\dfrac{\sin^4 x}{4}$

c. $\dfrac{2}{5}(\sin x)^{5/2}$

d. $\dfrac{5}{2}(\sin x)^{5/2}$

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Descriptive

Time : 2 hrs. 30 min. Marks : 50

[Answer question no.1 & any four (4) from the rest]

1. Evaluate 5+5=10

(a) $\lim_{t \to \infty} \frac{t^2 - 2t + 3}{2t^2 + 5t - 3}$

(b) $\lim_{x \to 0} \frac{\tan 2x - x}{3x - \sin x}$

2. 5+5=10

(a) $\int \frac{\sin^{-1} x}{\sqrt{1 - x^2}} dx$

(b) $\int \log\left(x + \sqrt{x^2 + a^2}\right) dx$

3. Evaluate 5+5=10

(a) $\lim_{\substack{x \to \infty \\ y \to 3}} \frac{2xy - 3}{x^3 + 4y^3}$

(b) $\lim_{\substack{x \to 1 \\ y \to 2}} \frac{2x^2 + y^2}{2xy}$

4. Solve 5+5=10

(a) $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = \sin 2x$

(b) $\left(D^3 + 1\right)y = \left(e^x + 1\right)^2$

5. (a)Find the quation of the tangent of the curve $xy^2 = 4(4-x)$ at the point where it is cut by the line $y = x$ **4+6=10**

(b)Find all the asymptote of the curve

$x^3 + 2x^2y - xy^2 - 2y^3 + x^2 - y^2 - 2x - 3y = 0$

6. State and Prove Rolle's Theorem **10**

7. Find the Derivative with respect to x **5+5=10**

(a) $y = e^{2x} \sin x + x^3 \log x$

(b)

$y^{2/3} = a^{2/3} - x^{2/3}$

8. **5+5=10**

Is $f(x) = \begin{cases} -x, x < 0 \\ x, 0 \le x \le 1 \\ 2-x, x > 1 \end{cases}$ **continuous at** $x = 1$

And

$x = 0$

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