

Shikashan Mandal Karad's  
**Mahila Mahavidyalaya Karad**  
B.Sc. (Part-I) (Preliminary -I) Examination  
DSC-A5: MATHEMATICS-I(CBCS)

Calculus

**Day and Date: Thursday and 06/01/2023**

Time: 1:00 PM to 3:00 PM

Total Marks: 40

Instructions: 1) All questions are compulsory.  
2) Figures to the right indicate full marks.

**Q1) Choose the most correct alternative**

**[8]**

a) The infinite series  $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \frac{x^8}{8!} \dots$  is expansion of \_\_\_\_\_

i)  $\cos x$

ii)  $\sin x$

iii)  $e^x$

iv)  $a^x$

b) If  $f(x) = e^x, x \in [0,1]$  then the value of c of L.M.V.T. IS \_\_\_\_\_

i)  $e - 1$

ii)  $\frac{1}{e-1}$

iii)  $e(e - 1)$

iv)  $\log(e - 1)$

c) Which of the following is a mean value theorem .....

i) Euler's Theorem

ii) Leibnitz's Theorem

iii) Taylor's Theorem

iv) Rolle's Theorem

d) If  $f(x) = |x|$  then  $f(x)$  is ..... at  $x = 0$ .

i) Continuous

ii) Derivable

iii) Discontinuous

iv) None

e) If neither  $\lim_{n \rightarrow c^-} f(x)$  nor  $\lim_{n \rightarrow c^+} f(x)$  exist, then the function is \_\_\_\_\_.

i) Discontinuous of first kind

ii) Discontinuous of second kind

iii) Continuous

iv) Differentiable

f) Left hand limit of  $f(x) = 2x^2 - 1$  for  $0 \leq x \leq 2$   
 $= 4x + 1$  for  $2 \leq x \leq 4$

as  $x \rightarrow 2$  is \_\_\_\_\_

- i) 7
- iii) 6

- ii) 9
- iv) -1

g) Every differentiable function is \_\_\_\_\_.

- i) Continuous
- iii) Removable discontinuous

- ii) Discontinuous
- iv) None of the above.

h) If  $y = e^{3x}$  then  $y_n$  is \_\_\_\_\_.

- i)  $e^{3nx}$
- iii)  $3^n$

- ii)  $3^n e^{3x}$
- iv)  $e^{3x}$

**Q2) Attempt any two of the following.**

**[16]**

- a) State and prove Leibnitz's theorem.
- b) State and prove Lagrange's mean value theorem.
- c) If  $y = (x^2 - 1)^n$  then prove that  $(x^2 - 1)y_{n+2} + 2xy_{n+1} - n(n - 1)y_n = 0$ .

**Q3) Attempt any four of the following.**

**[16]**

- a) Evaluate  $\lim_{n \rightarrow \infty} \sqrt{x} [ \sqrt{x+1} - \sqrt{x} ]$
- b) Verify Cauchy's M.V.T. for  $2x^3$  and  $x^6$  in  $[a, b]$  and find c.
- c) Find  $n^{\text{th}}$  derivative of  $y = \sin^2 x$ .
- d) Expand  $\log(1+x)$  I power of x.
- e) Evaluate  $\lim_{n \rightarrow 0} \frac{\log(5+x) - \log(5-x)}{x}$ .
- f) Verify Rolle's theorem  $f(x) = x^3 - 4x$  on  $[-2, 2]$ .

Shikshan Mandal Karad's  
**Mahila Mahavidyalaya Karad**  
B.Sc. (Part-I) (Preliminary-I) Examination  
DSC-A6: MATHEMATICS-II (CBCS)  
Differential Equations

**Day and Date: Thursday and 07/01/2023**

Time: 1:00 PM to 3:00 PM

Total Marks: 40

Instructions: 1) All questions are compulsory.  
2) Figures to the right indicate full marks.

**Q1) Choose the most correct alternative**

[8]

- a) Find out order and degree  $\frac{d^2y}{dx^2} = \sqrt{1 + \left(\frac{dy}{dx}\right)^3}$
- |           |          |
|-----------|----------|
| i) 2, 3   | ii) 2, 1 |
| iii) 1, 3 | iv) 2, 2 |
- b) The integrating factor of the equation  $\frac{dx}{dy} + py = Q$  is \_\_\_\_\_.
- |                       |                      |
|-----------------------|----------------------|
| i) $e^{\int p dy}$    | ii) $e^{\int p dx}$  |
| iii) $e^{-\int p dx}$ | iv) $e^{-\int p dy}$ |
- c) The general solution of the differential equation  $\sqrt{y + px} = p$  is \_\_\_\_\_.
- |                     |                     |
|---------------------|---------------------|
| i) $y = cx^2 + c$   | ii) $y = -cx + c^2$ |
| iii) $y = cx + c^2$ | iv) $y = cx + c$    |
- d) The value of  $\frac{1}{D^2+2} \sin x$  is \_\_\_\_\_.
- |                         |               |
|-------------------------|---------------|
| i) $-\cos x$            | ii) $-\sin x$ |
| iii) $\frac{\sin x}{3}$ | iv) $\sin x$  |
- e) The solution of the equation  $p^2 - 9p + 18 = 0$  is \_\_\_\_\_.
- |                                    |                                    |
|------------------------------------|------------------------------------|
| i) $(y - 6x - c)(y - 3x - c) = 0$  | ii) $(y + 6x - c)(y - 3x - c) = 0$ |
| iii) $(y - 6x - c)(y - x - c) = 0$ | iv) $(y - 9x - c)(y - 2x - c) = 0$ |

