PETRODICE ACADEMY

Head office: Hyderabad branch

Topic: Calculus

Time Allowed: 45 Min   **Maximum Marks:25**

Read the following instructions carefully.

01. (i) Question Numbers 01 to 05 (05 questions) will carry one mark each.
       (ii) Question Numbers 06 to 15 (10 questions) will carry two marks each.

02.**Wrong answers carry 33% negative marks. In Q. 01 to Q.05, 1/3 mark will be deducted for each wrong answer and in Q. 06 to Q.15,2/3 mark will be deducted for each wrong answer. However, there is no negative marking for numerical answer Type questions.**

GROUP – I

Each question carries ONE mark

5 x 1 = 5

1. $\lim_{X \to 0} \frac{|X|}{X} = $ _ where $|X|$ is a modulus of a function
   a)0   b)1
   c)-1   d) limit does not exist

2. The magnitude of the gradient of the function f = xyz^3 at (1,0,2) is
   a) 0   b) 3
   c) 8   d) ∞

3. The expression curl (grad f), where f is a scalar function, is
   a) Equal to ∇^2 f
   b) Equal to div (grad f)
   c) A scalar of zero magnitude
   d) A vector of zero magnitude

4. The value of $\int_{x=0}^{1} \int_{y=0}^{2} xy \, dx \, dy$ is _.

5. let f be a real valued function of a real variable defined as
   f(x) = x^2 for x≥0, and f(x)= - x^2 for x<0
   which one of the following statements is true?
   a) f(x) is discontinuous at x=0
   b) f(x) is continuous but not differentiable at x=0

   c)f(x) is differentiable but its first derivative is not continuous at x=0
   d)f(x) is differentiable but its first derivative is not

GROUP – II

Each question carries TWO mark

10 x 2 = 20

1. The function f(x) = x^3- $6x^2$+ 9x+25 has
   a) A maxima at x = 1 and a minima at x = 3
   b) A maxima at x = 3 and a minima at x = 1
   c) No maxima, but a minima at x = 3
   d) A maxima at x = 1, but not minima

2. Equation of the line normal to function f(x) = (x-8)$^{2/3}$+1 at P(0,5) is
   a) y = 3x -5
   b) y = 3x +5
   c) 3y = x+15
   d) 3y = x -15

3. A cubic polynomial with real coefficients
   a) Can possibly no extrema and no zero crossings
   b) May have up to three extrema and up to 2 zero crossings
   c) Cannot have more than two extrema and more than three zero crossings
   d) Will always have an equal number of extrema and zero crossings

4. $\nabla \times (\nabla \times P)$, where P is a vector, is equal to
   a) $P \times \nabla \times P - \nabla^2 P$
   b) $\nabla^2 P + \nabla (\nabla. P)$
   c) $\nabla^2 P + \nabla \times P$
   d) $\nabla (\nabla \cdot P) - \nabla^2 P$

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5. The value of the integral of the function g(x, y) = $4x^3 + 10y^4$ along the straight line segment from the point (0, 0) to the point (1, 2) in the x-y plane is

a) 33

b) 35

c) 40

d) 56

6. The temperature at any point in the space is given by T = xy+yz+zx , then the directional derivative of T in the direction of the vector 3i-4k at the point (1,1,1) is .

a) $\frac{-2}{5}$

b) $\frac{2}{5}$

c) $\frac{-5}{2}$

d) $\frac{5}{2}$

7. LaGrange's mean value theorem does not hold for f(x)= $x^{\frac{-2}{3}}$ in $[-1,1]$,because

a) not continuous in (-1,1)

b) not differentiable in (-1,1)

c) continuous but not differentiable in (-1,1)

d) neither continuous nor differentiable in the given interval

8. Velocity vector of a flow field is given as $V = 2xy\hat{i} - x^2z\hat{j}$. The vorticity vector at (1, 1, 1) is

a) 4i-j

b)4i-k

c)i-4j

d)i-4k

9. For the function f(x) = $x^2 e^{-x}$, the maximum occurs when x is equal to

a) 2

b) 1

c) 0

d) -1

10.Area bounded by the curve y=x^2 and the lines x=4 and y=0 is given by

a) 64

b) 64/3

c) 128/3

d) 128/4