

\* Right indicates full marks

[40]

- 1) Given  $f(x) = x^3 - 12x^2 + 45x + 8$  at which point does  $f(x)$  has its minimum value  
a) 1                      b) -1                      c) 0                      d) 2
- 2) Which is correct formula for finding the area enclosed the curves  
if  $y_1 = f(x)$  and  $y_2 = g(x)$  is given by -----  
a)  $\int_{x_1}^{x_2} y_2 - y_1 \, dx$  b)  $\int_{x_1}^{x_2} y_1 - y_2 \, dx$  c)  $\int_{y_1}^{y_2} x_2 - x_1 \, dx$  d)  $\int_{y_1}^{y_2} x_1 - x_2 \, dx$
- 3) Function  $f$  should be \_\_\_\_ on  $[a, b]$  according to Rolle's theorem.  
a) Continuous    b) Non-continuous    c) Integral    d) Non-existent
- 4) Which formula is applicable for revolution about x-axis  
a)  $V = \int_a^b \pi x^2 dy$     b)  $V = \int_a^b \pi y^2 dx$     c)  $V = \int_a^b \pi dy$     d)  $V = \int_a^b x^2 dy$
- 5) The equation of the normal to the curve  $y = \sin x$  at  $(0, 0)$  is -----  
a)  $X=0$                       b)  $y=0$                       c)  $X+Y=0$                       d)  $X-Y=0$
- 6) ) How would you split the rational fraction  $f(x)$  into partial fraction  $f(x) = \frac{x^2+1}{x^2-3x-4}$   
a)  $\frac{A}{x-4} + \frac{B}{x+1}$     b)  $\frac{A}{x-4} + \frac{Bx}{x+1}$     c)  $\frac{A}{x-4} - \frac{B}{x-1}$     d)  $\frac{A}{x-1} - \frac{Bx}{x-4}$
- 7) The constant of integration  $c$  does not appear in the final value of integral hence it is called as-----  
a) Definite integral    b) Indefinite integral    c) May be indefinite integral    d) None of these
- 8) ) If eccentricity is greater one then it is  
a) Hyperbola                      b) Parabola                      c) Ellipse                      d) None of these
- 9) If  $r = \frac{6}{3+2\sin i}$  find eccentricity with the help of given equation  
a)  $e=3/2$     b)  $e=2/3$     c)  $e=3$     d)  $e=2$
- 10) In this equation  $dN/dT$  is the growth rate of the population in a given instant where  $N$  is  
a) Population Size    b) Population rate    c) per Capita    d) Number of terms
- 11) If  $y = x^n$  then  $\frac{dy}{dx} = nx^{n-1}$  then  $\frac{d^2y}{dx^2} = \text{-----}$   
a)  $n(n+1)x^{n-1}$     b)  $n(n-1)x^{n-2}$     c)  $n(n+1)x^{n-2}$     d)  $n x^{n-1}$
- 12) Local minimum value of  $f$  if  $f(c) \leq f(x)$  where  $x$  is near  $c$   
a)  $f(c) \leq f(x)$     b)  $f(c) \geq f(x)$     c)  $f(c) = f(x)$     d)  $f(c) < f(x)$

13) Find the equation of tangent to the circle  $x^2 + y^2 = 25$  at (3,4)

- a)  $dy/dx = -x/y$    b)  $dy/dx = x/y$    c)  $3x+4y=25$    d)  $4x+3y=25$

14) Find the velocity at time  $t$  where  $t=2$  if  $f(t) = t^3 - 6t^2 + 9t$

- a) -3 m/s   b) 3 m/s   c) 4m/s   d) -4 m/s

15) If  $f'(x)$  is more than zero on an interval then  $f$  is ----- on that interval

- a) increasing   b) strongly increasing   c) decreasing   d) strongly decreasing

16) The line  $y=x+1$  is a tangent to the curve  $y^2 = 4x$  at the point

- a) (-1, 2)   b) (1, 2)   c) (-1, 2)   d) (2, 1)

17) Find the average value of  $f(x) = x^2 \in [1, 2]$

- a) 5/3   b) 8/3   c) 7/3   d) 2/3

18) ) Find the directrix of the parabola  $y^2 = 10x$

- a)  $x = -5/2$    b)  $x = 5/2$    c)  $y = 5/2$    d)  $y = -5/2$

19) Evaluate  $\int (4x^3 - 2x + 1)dx$

- a)  $x^3 - 2 + c$    b)  $x^4 - x^2 + x + c$    c)  $x^4 - 2x^2 + x + c$    d)  $4x^4 - x^2 + x + c$

20) Evaluate the Foci on X-axis if  $\frac{x^2}{4} - \frac{y^2}{16} = 1$

- a) (+3, 0)   b) (-3, 0)   c) (0, 0)   d) Both a and b

Q.2) A) Attempt the following (Solve any one)

[04]

i) The position of the particle is given by the equation  $s = f(t) = t^3 - 6t^2 + 9t$  where  $t$  is measured in seconds and  $s$  in meters i) Find velocity at time  $t$  ii) what is velocity after 2s and 4s iii) When particle is moving forward iv) When particle is at rest

ii) If  $f(x) = xe^x$  find  $f'(x)$  find  $n$ th derivative  $f^n(x)$  and also differentiate  $y = x^2 \sin x$

B) Attempt the following (Solve any one)

[03]

i) If  $x^2 + y^2 = 25$  find  $\frac{dy}{dx}$  find an equation of tangent to the circle  $x^2 + y^2 = 25$

at the point (3,4)

ii) Find the point on the curve  $y = x^4 - 6x^2 + 4$  where tangent line is horizontal

Q 3) A) Attempt the following (Solve any one)

[04]

i) Evaluate  $\int_1^2 \log x \, dx$  by using integral by parts

ii) Evaluate  $\int_2^4 x \sin x^2 \, dx$  by using substitution method

B) Attempt the following (Solve any one)

[03]

i) Evaluate  $\int \frac{7x+1}{x^2+x-2} \, dx$



ii) Finding Area of region between two curves if  $f(x) = x+4$  and  $g(x) = 3 - x/2$  belong to  $[1, 4]$

Q.4) ) A) Attempt the following (Solve any one ) [04]

i) Use the mean value theorem to solve Suppose  $f(0) = -3$   $f'(x) = x^5 \forall x$

How large can  $f(2)$  possibly be

ii) The marginal cost manufacturing  $x$  shoes is  $6 + 10x - 6x^2$  the cost producing a pair of shoes is Rs 12 Find total and average cost function

B) Attempt the following (Solve any one ) [03]

i) Evaluate average value of continuous function if  $f(x) = x^2 - 5x + 6 \cos(\pi x) \in [-1, \frac{5}{2}]$

ii) Calculate consumer surplus if demand function  $p = 50 - 2x$  and  $x = 20$

Q.5) Attempt the following (Solve any one ) [04]

i) Define Continuous function of two variable at  $(a, b)$  and Show that  $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{x^2+y^2}$

does not exist also find extreme values of  $f(x, y) = y^2 - x^2$

ii) Define linear approximation of  $(a, b)$  Show that  $f(x, y) = xe^{xy}$  is differentiable at  $(1, 0)$  and find its linearization. Use it to approximate  $f(1.1, -0.1)$

B) Attempt the following (Solve any one ) [03]

i) If  $z = x^2y + 3xy^4$  where  $x = \sin 2t$ ,  $y = \cos t$  find  $dz/dt$  when  $t = 0$

ii) A rectangular box without a lid is to be made from  $12m^2$  of card board find maximum volume of such box.

Q. 6) A) Attempt the following (Solve any one ) [04]

i) Eliminate the parameter to find a cartesian equation of the curve

$$x = 3 + 2\cos t, y = 1 + 2\sin t \quad \frac{\pi}{2} \leq t \leq 3\frac{\pi}{2}$$

ii) Evaluate  $\iint_R xy^2 dx dy$   $R = \{(x, y) / 2 \leq x \leq 5, 0 \leq y \leq 1\}$

B) Attempt the following (Solve any one ) [03]

i) Find the polar equation of the conic with focus at the origin and given directrix  $X = 4$  and eccentricity  $e = 3/5$

iii) Evaluate  $\int_0^1 \int_1^2 \int_3^4 xyz dx dy dz$

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