

# Assignment(matrix theory)

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## I. A FILL IN THE BLANKS

- 1) The larger of  $\cos(\ln \theta)$  and  $\ln(\cos \theta)$  if  $e^{\frac{-\pi}{2}} < \theta < \frac{\pi}{2}$  is .....  
(1983 – 1Mark)
- 2) The function  $y = 2x^2 - \ln|x|$  is monotonically increasing for values of  $x (\neq 0)$  satisfying the inequalities ..... and monotonically decreasing for values of  $x$  satisfying the inequalities .....  
(1983 – 2Marks)
- 3) The set of all  $x$  for which  $\ln(1+x) \leq x$  is equal to .....  
(1987 – 2Marks)
- 4) Let  $P$  be a variable point on the ellipse  $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$  with foci  $F_1$  and  $F_2$ . If  $A$  is the area of the triangle  $PF_1F_2$  then the maximum value of  $A$  is .....  
(1994 – 2Marks)
- 5) Let  $C$  be the curve  $y^3 - 3xy + 2 = 0$  If  $H$  is the set of points on the curve  $C$  where the tangent is horizontal and  $V$  is the set of the point on the curve  $C$  where the tangent is vertical then  $H = \dots$  and  $V = \dots$   
(1994 – 2Marks)

## II. B TRUE / FALSE

- 1) If  $x - r$  is a factor of the polynomial  $f(x) = a_n x^4 + \dots + a_0$ , repeated  $m$  times ( $1 < m \leq n$ ), then  $r$  is a root of  $f'(x) = 0$  repeated  $m$  times.  
(1983 – 1Mark)
- 2) For  $0 < a < x$ , the minimum value of the function  $\log_a x + \log_x a$  is 2.  
(1984 – 1Mark)

## III. C MCQs WITH ONE CORRECT ANSWER

- 1) If  $a + b + c = 0$ , then the quadratic equation  $3ax^2 + 2bx + c = 0$  has  
(1983 – 1Mark)
  - a) at least one root in  $[0,1]$
  - b) one root in  $[2,3]$  and other in  $[-2,-1]$
  - c) imaginary roots
  - d) none of these
- 2)  $AB$  is a diameter of a circle and  $C$  is any point on the circumference of the circle. Then  
(1983 – 1Mark)
  - a) the area of  $\Delta ABC$  is maximum when it is isosceles
  - b) the area of  $\Delta ABC$  is minimum when it is isosceles
  - c) the perimeter of  $\Delta ABC$  is minimum when it is isosceles
  - d) none of these
- 3) The normal to the curve
 
$$x = a(\cos \theta + \theta \sin \theta)$$

$$y = a(\sin \theta - \theta \cos \theta)$$
 at any point ' $\theta$ ' is such that (1983 – 1Mark)
  - a) it makes constant angle with the  $x$  - axis
  - b) it passes through the origin
  - c) it is at a constant distance from the origin
  - d) none of these
- 4) If  $y = a \ln x + bx^2 + x$  has its extremum values at  $x = -1$  and  $x = 2$ , then (1983 – 1Mark)
 

a) $a = 2, b = -1$	c) $a = -2, b = \frac{1}{2}$
b) $a = 2, b = \frac{-1}{2}$	d) none of these
- 5) Which one of the following curves cut the parabola  $y^2 = 4ax$  at right angles? (1994)
 

a) $x^2 + y^2 = a^2$	c) $y = ax$
b) $e^{\frac{x}{2a}}$	d) $x^2 = 4ay$
- 6) The function defined by  $f(x) = (x+2)e^{-x}$  is  
(1994)
  - a) decreasing for all  $x$
  - b) decreasing in  $(-\infty, -1)$  and increasing in  $(-1, \infty)$
  - c) increasing for all  $x$
  - d) decreasing in  $(-1, \infty)$  and increasing in  $(-\infty, -1)$

7) The function

$$f(x) = \frac{\ln(\pi + x)}{\ln(e + x)}$$

is (1995S)

- a) increasing on  $(0, \infty)$
- b) decreasing on  $(0, \infty)$
- c) increasing on  $(0, \frac{\pi}{e})$ , decreasing on  $(\frac{\pi}{e}, \infty)$
- d) decreasing on  $(0, \frac{\pi}{e})$ , increasing on  $(\frac{\pi}{e}, \infty)$

8) On the interval  $[0, 1]$  the function  $x^{25}(1-x)^{25}$  takes its maximum value at the point (1995S)

- 1) 0      2)  $\frac{1}{4}$       3)  $\frac{1}{2}$       4)  $\frac{1}{3}$