MATHEMATICS CLASS TEST # 04 FOR SPARK BATCH

TIME: 1HR **MM: 120**

This paper contains 30 multiple choice questions. Each question has 4 choices (A), (B), (C) and (D), out of which **ONLY ONE** is correct. **MARKING: (+4, –1, 0)**

1. If a, b, $c \in R$ and the quadratic equation $ax^2 + bx + c = 0$ has no real roots, then
   (a) $c < 0$ (b) $a + b + c > 0$ (c) $a + b + c < 0$ (d) $(a + b + c)c > 0$

2. If α, β, γ are roots of the equation $x^3 + 3x - 1 = 0$, the equation whose roots are $\alpha^2, \beta^2, \gamma^2$ is
   (a) $x^3 + 6x^2 + 9x + 1 = 0$ (b) $x^3 + 6x^2 + 9x - 1 = 0$ (c) $x^3 + 6x^2 - 9x + 1 = 0$ (d) $x^3 + 3x^2 - 1 = 0$

3. The least integral value of 'a' such that $(a - 2)x^2 + 8x + a + 4 > 0, \forall\ x \in R$ is
   (a) 3 (b) 4 (c) 5 (d) 6

4. Let p, q be roots of the equation $x^2 - 4x + A = 0$ and r & s be roots of the equation $x^2 - 20x + B = 0$. If $p < q < r < s$ and are in AP then (A, B) is
   (a) $(0, -96)$ (b) $(96, 0)$ (c) $(0, 96)$ (d) $(-96, 0)$

5. If α, β are roots of the equation $x^2 - 3x + 1 = 0$ then the equation with roots $\frac{1}{\alpha - 2}, \frac{1}{\beta - 2}$ will be
   (a) $x^2 - x - 1 = 0$ (b) $x^2 + x - 1 = 0$ (c) $x^2 + x + 2 = 0$ (d) none of these

Space for rough work

6. If one root of the quadratic equation $2x^2 - 2kx + k - 4 = 0$ is smaller than 1 and other root is greater than 2, then complete set of values of k is

   (a) $(-2, \infty)$ (b) $\left(\frac{4}{3}, \infty\right)$ (c) $\left(-2, \frac{4}{3}\right)$ (d) $(-\infty, -2)$

7. If α, β are the roots of the equation $x^2 - 2x + 3 = 0$ then the equation whose roots are $\alpha^3 - 3\alpha^2 + 5\alpha - 2$ and $\beta^3 - \beta^2 + \beta + 6$ is

   (a) $x^2 + 3x - 2 = 0$ (b) $x^2 - 3x + 2 = 0$ (c) $x^2 + 3x + 2 = 0$ (d) $x^2 - 4x + 3 = 0$

8. If $a + b + c = 1$, $a^2 + b^2 + c^2 = 2$ and $a^3 + b^3 + c^3 = 3$ then

   (a) $ab + bc + ca = \frac{1}{2}$ (b) $ab + bc + ca = \frac{1}{3}$ (c) $abc = \frac{1}{6}$ (d) $abc = \frac{1}{9}$

9. If $x^2 - ax - 3 = 0$ and $x^2 + ax - 15 = 0$ have a common root then $a =$

   (a) 2 (b) 3 (c) 4 (d) 5

10. If the equation $x^2 - 4x + 5 = 0$ and $x^2 + ax + b = 0$, $(a, b \in R)$ have a common root then $a + b =$

    (a) -1 (b) 0 (c) 1 (d) 2

Space for rough work

11. If $x = 3+\sqrt{5}$ then the value of $x^4 - 12x^3 + 44x^2 - 48x + 17$ is

(a) 1 (b) 2 (c) 3 (d) $3+\sqrt{5}$

12. The smallest integer x for which the inequality $\frac{x-5}{x^2+5x-14} > 0$ satisfied is given by

(a) -7 (b) -5 (c) -4 (d) -6

13. The expression $\frac{x^2+2x+1}{x^2+2x+7}$ lies in the interval $(x \in R)$

(a) $[0,1]$ (b) $(-\infty,0] \cup (1,\infty)$ (c) $[0,1)$ (d) $(0,1)$

14. The value of 'a' for which the sum of the squares of the roots of $2x^2 - 2(a-2)x - (a+1) = 0$ is least is

(a) 1 (b) $\frac{3}{2}$ (c) 2 (d) -1

15. If $\alpha \neq \beta, \alpha^2 = 5\alpha - 3, \beta^2 = 5\beta - 3$ then the equation whose roots are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$ is

(a) $x^2 - 5x + 3 = 0$ (b) $x^2 - 5x - 3 = 0$ (c) $3x^2 - 80x + 9 = 0$ (d) $3x^2 - 19x + 3 = 0$

Space for rough work

16. If the equation $(a^2-5a+6)x^2+(a^2-3a+2)x+(a^2-6a+8)=0$ has more than two roots, then the value of a is
(a) 1 (b) 2 (c) 3 (d) 4

17. If the roots of $4x^2+5k=(5k+1)x$ are differ by unity, then $k=$
(a) $\frac{1}{5}$ (b) $\frac{2}{5}$ (c) 3 (d) 4

PARAGRAPH FOR QUESTION NUMBER 18 TO 20:

Consider a function $f(x)=\frac{3x+a}{x^2+3}$ which has greatest value equal to $\frac{3}{2}$.

18. The value of the constant number a is equal to
(A) 1 (B) 2 (C) 3 (D) 4

19. The minimum value of $f(x)$ is equal to
(A) $-\sqrt{3}$ (B) $-\frac{1}{2}$ (C) $\frac{1}{2}$ (D) 0

20. If the equation $f(x)=b$ has two distinct real roots then the number of integral values of b is equal to
(A) 0 (B) 1 (C) 2 (D) 3

Space for rough work

21. The value of $\sum_{n=1}^{1023} \log_2\left(1+\frac{1}{n}\right)$ is equal to

(a) 4 (b) 6 (c) 8 (d) 10

22. The value of $\left[\frac{1}{\log_2 \pi}+\frac{1}{\log_6 \pi}\right]$ is equal to, where $[x]$ denotes greatest integer less than or equal to x

(a) 2 (b) 3 (c) 4 (d) 5

23. $2^x + 3^{\left(\frac{1}{x}\right)} = -2$ holds for $x \in$

(a) $[0,\infty)$ (b) $(-\infty,0]$ (d) R (d) none of these

24. If $\log_{10} 2 = 0.3010$ then the number of digits in 5^{200} is

(a) 139 (b) 140 (c) 141 (d) 142

25. The value of $7^{\log_3 5} + 3^{\log_5 7} - 5^{\log_3 7} - 7^{\log_5 3}$

(a) –1 (b) 0 (c) 3 (d) 7

Space for rough work

26. The value of $\left(\frac{\log_2 24}{\log_{96} 2}\right)-\left(\frac{\log_2 192}{\log_{12} 2}\right)$ is

(a) 3 (b) 4 (d) 5 (d) $\log_2 3$

27. The value of $49^{(1-\log_7 2)}+5^{-\log_5 4}$ is

(a) 25 (b) $\frac{25}{2}$ (c) $\frac{25}{4}$ (d) $\frac{25}{8}$

28. Number of solution(s) of $\log_4(x-1)=\log_2(x-3)$ is

(a) 3 (b) 1 (c) 2 (d) 0

29. If $x=1+\log_a(bc)$, $y=1+\log_b(ca)$ & $z=1+\log_c(ab)$ then

(a) $x+y+z=xy+yz+zx$ (b) $xyz=xy+yz+zx+1$

(c) $xyz=x+y+z$ (d) $xyz=xy+yz+zx$

30. The value of $\sqrt{10^{2+\frac{1}{2}\log_{10} 16}}$

(a) 10 (b) 20 (c) 40 (d) 80

Space for rough work