COMPETITIVE ENTRANCE 2013 SESSION

Department: Civil Engineering and Forestry Techniques, Electrical and Power Engineering, Mechanical Engineering and Computer Science

1st Cycle Option ALL

Paper 2: Mathematics Duration 3hours

1. The value of x given that $32^x = 0.25$ is
   A: 2/5 B: 5/2 C: -2/5 D: 4
2. The eight term of the geometric sequence is 256. If the first member of the sequence is 2 then common ratio is:
   A:2 B:7 C: 128 D: 4
3. Given the function $f: x \longrightarrow \frac{2x}{4-3x}; x \epsilon \mathbb{R} - \left\{\frac{4}{3}\right\}$. The range is **A: R-{4/3}. B:R-{2/3}. C: R-{-3/21}. D: x$\epsilon\mathbb{R}$**
4. The set of values for x for which $(x-3)(x-4) < (x-3)$ is
   A : $x < 4$ B: x > 4 C: 5 < x < 3 D: 3 < x < 5
5. The complex number $Z = \frac{2-i}{1-i}$ can be reduced to the form $x + iy$, where x and y are real numbers. Then the values of x and y are;
   A: 3/2 and ½ B: ½ and -3/C: -1/2 and -3/2 D: 3/2 and ½
6. $\int_0^2 \frac{x}{1+x^2} dx$ *is*
   A: $\ln(1/5)$ B: ln(5/2) C: $\ln(\sqrt{5})$ D: $\ln(5^2)$
7. The sequence whose nth term is given by $S_n = n(2n+1)$ is **A: a GP B: an AP C: an infinite sequence D: a finite sequence**
8. The coordinates of the point on inflexion of the curve $f(x) = x^4 - 4x^3$ are;
   A: (3, -27) B: (0,0) C: D: (3,27)
9. i^{1003} is **A: 1 B: i C: -i D: -1**
10. If $\log_5 3 = x$, then the value of 625^x is **A: 12 B: 81 C: 64 D: 60**
11. $\lim_{x\to 1}\left(\frac{x^3-1}{x-1}\right)$, where x≠ 1 gives
    A: 0 B: 3 C: ∞ D: -3
12. Given the Cartesian equation of the line as $\frac{x-5}{3} = \frac{y+4}{7} = \frac{z-6}{2}$ then the line passes through the point;**A: (5, -4, 6) B: (3, 7, 2) C: (-5, 4, -6) D: (5/3, -4/3, 3)**
13. The equation $x^2 - 12x + k + 3 = 0$, has real roots, the range of values of k are;
    A: $-2 \leq x \leq 6$ B: $k \leq 2 \cup k \geq 6$ C: $k < -2 \cup k < 6$ D: $k < -2 \cap k > 6$
14. If $\frac{dy}{dx} + 5 = 6x$ at A(2,1), then the expression of y in terms of x will be
    A: $y = 3x^2 - 5x - 1$ B: $y = 6x - 5$
    C: $y = 12/5$ D: $y = 6x^2 - 5$
15. Given that the parametric equations of a curve are $x = \frac{1}{t-1}$ *and* $y = \frac{1}{t+1}$ then the gradient of the curve at the point where t = 2 is;
    A: -1 B; 1/9 C: 1 D: 1/3
16. The number of ways in which we can arrange the letters of the word **" NDOMBOLO"** is**;**
    A: 40320 B: 33 C: 6720 D: 8
17. The term independent of x in the expansion of $(2x - \frac{1}{x^2})^6$ is **A:2 B: 15 C:16 D:240**
18. How many 4digits numbers can be formed from the numbers **1, 2, 3, 4 and 5** if repetition is not allowed?
    A: 625 B: 256 C: 120 D: 24

19. The oblique (skew) asymptote of the curve $y = \frac{2x^3+x^2}{2(x^2-1)}$ **is *A: y = x+2 B: y = x C: y = x+1/2 D: y = 2x+1***

20. The value of $\sum_{r=1}^{\infty} 4(1/3)^r$ is;
A: 2 B: 4 C: 3 D: 4/3

21. If $y = \ln x^7$, then $\frac{d^2y}{dx^2}$ *is*
A: *7/x* B: *-7/x²* C: *-7/x* D: *7/x²*

22. Given the geometric series $\frac{x}{x-3} + 1 + \frac{x-3}{x} + \cdots$ The range of values of x for the series is convergent is
A: *x > 3* B: x < C: x>3/2 D:x < 3

23. If $cost = -\frac{1}{2}$ then the general solution is **A: $2n\pi \pm \frac{2\pi}{3}$ B: $2n\pi + \frac{2n\pi}{3}$ C: $2n\pi - \frac{2n\pi}{3}$ D: $2n\pi \pm \frac{\pi}{3}$**

24. The direction of the vector $\vec{a} = -3\vec{\imath} + 5\vec{\jmath}$ is **A: 59⁰ B: -59⁰ C:120⁰ D: 31⁰**

25. If $x^3 + y^3 = 10$, then $\frac{dy}{dx}$ at the point (1,1) is
A: 1 B:-1 C: ½ D: 2

26. **A** committee of 4boys and 5girls is to be selected from a group of 8boys and 9girls. In how many ways can this Committee be formed? **A: 8820 ways B: 196ways C: 24310 ways D: 2ways**

27. An even function is symmetrical about :

28. **A: the line $y = x$ B: the origin C: the $y-$axis C: the $x-$axis**

29. If $f(x) = 0$ has a solution at $x = T$, then
A: $f(T) >$ B: $f(T) < 0$ C: $f(T) = 0$ D: $f(T) < 0$

30. The length of the vector $2\vec{\imath} - 4\vec{\jmath} - 4\vec{k}$ is
A: 36 B: ± 36 C: ± 6 D: 6

31. The arg. of z if $z = -\sqrt{3} - i$ is
A: $\frac{\pi}{6}$ B: $\frac{7\pi}{6}$ C: $-\frac{5\pi}{6}$ D: $5\frac{\pi}{6}$

32. **Given** that $P(A) = 1/4$ and $P(A \cup B) = 1/3$, if the evens A and B are independent, then P(B) Is **A: 1/22 B: 1/9 C: ¾ D: 2/3**

33. The upper quartile of a distribution is
A: The value below which 25% of the distribution lies
B: The value above which 25% of the distribution lies
C: The value above which 50% of the distribution lies
D: The value below which 50% of the distribution lies

34. The discrete random variables X and Y has a probability mass function defined by P(X –*x*)=c(3 –*x*);
x = 0, 1, 2, 3. The value of the constant c is;
A: 5/6 B: 1/2 C: 2/3 D: 1/6

35. **12** numbers are such that is 72. Another set of 8 numbers is such that their sum is 80. The mean of the combined set of 20 numbers is
A: 75 B: 7 C: 38/5 D: 8

36. **A** bag contains 4red balls and 5yellow balls. Two balls are randomly drawn from the bag without replacement, one after the other . what is the probability that both balls are of the same color?
A: 5/9 B: 5/18 C: 1/20 D:4/9

36. Two random variables X and Y are such that $\bar{X} \backsim N(30, 3)$ and $\bar{Y} \backsim N(40, 5)$. The distribution of $4\bar{X} - 2\bar{Y}$ is
A: N(40, 28) B: N(40, 68) C: N(200,4) D: N(40, 22)

37. **A** random variable has a probability density function $f(x) = 3x^k$ if $0 \leq x \leq 1$ and $f(x) = 0$ otherwise. The value of the constant k is

A: 1/2 B: 4 C:2 D: 1/3

38. A panel of two judges conducted and interview for 7 children and their respective ranking orders revealed that $\sum d^2 = 48$. Spearman's coefficient of rank correlation is

A: 6/7 B: 42/7 C: 1/7 D: 3/7

39. Linear regression is defined as

A: The straight line regression

B: The measure of the degree of relationship between two variables

C: The process of **estimating one variable corresponding to a given value of another variable.**

D: A function that relate two variables.

40. The power of a statistical test is

A: The probability of rejecting a false hypothesis

B: The probability of not rejecting a false hypothesis

C: the probability of committing a type 1 error

D: The probability of committing a type 2 error