Manaslu Public Secondary School
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Second Terminal Examination - 2079

Class: - XII F.M.: 75
Sub.: Basic Mathematics Time: 3:00 hrs P.M.: 30

Group 'A' [11×1=11]

1. Ten students compete in a race. In how many ways can the first three place be taken?
   a. 3 b. 27 c. 30 d. 120
2. The value of $7c_0+7c_1+.....7c_7$ is equal to:
   a. 28 b. 512 c. 62 d. 128
3. For what value of k, the system of equations $3x+ky=5$ and $x-y=2$ have no solution?
   a. 3 b. $\frac{-1}{3}$ c. -2 d. -3
4. If $4\sin^{-1}x+\cos^{-1}x=\pi$, then the value of x is equal to:
   a. $\frac{3}{5}$ b. $\frac{2}{5}$ c. $\frac{3}{4}$ d. 1
5. If $\sin(x+y)=\log(x+y)$, then the value of $\frac{dy}{dx}$ is equal to:
   a. 1 b. -1 c. 2 d. -2
6. The derivative of $\cos^{-1}\frac{x}{a}$ with respect to x is:
   a. $\sin^{-1}x$ b. $\frac{1}{\cos x}$ c. $\frac{-1}{\sqrt{1-x^2}}$ d. $\frac{-1}{\sqrt{a^2-x^2}}$
7. $\int \frac{dx}{x^2+2x+2}$ equals:
   a. $\frac{1}{2}\tan^{-1}(x-1)+c$ b. $\log\tan(x+1)+c$
   c. $(x+1)\tan^{-1}x+c$ d. $\tan^{-1}(x+1)+c$
8. Which one of the following is true for the quadratic equation $3x^2+2x+k=0$ has real roots?
   a. $k\geq 3$ b. $k<3$ c. $k\geq\frac{1}{3}$ d. $k<\frac{1}{3}$
9. Which one of the following is nth term of the series $1+(1+2)+(1+2+3)+.....$
   a. n b. $\frac{n(n+1)(n+2)}{6}$ c. $\left(\frac{n(n+1)}{2}\right)^2$ d. $\frac{n(n+1)}{2}$
10. What is the value of k? When one root of $x^2-11x+k=0$ and $x^2-14x+2k=0$ may be common?
    a. 32 b. 24 c. 12 d. 16
11. The number of terms in the expansion $(a-x)^{21}$ is:
    a. 22 b. 20 c. 11 d. 21

Group 'B' [8×5=40]

12. a. In how many ways can the letter of the word "NOTATION" can be arranged? (2)
    a. find the number of arrangements of the letters of the word "Laptop" so that
       i. the vowels may never be separated.
       ii. All the consonants may not be together. (3)
13. a. Prove that the roots of the equation (x-a) (x-b)=k2 are real for all values of k. (2) (2)
    b. In the roots of the equation ax^2+bx+c = be int eh ratio of3:4, prove that $12b^2-49ac=0$ (3)
14. a. Find the middle term in the expansion $(2a+3x)^{30}$. (2)
    b. If $(1+x)^n=c_0+c_1x+c_2x^2+\cdots+c_nx^n$ Prove that
    $c_0+2c_1+3c+\ldots\ldots\ldots+(n+1)c_n=(n+2)2^{n-1}$ (3)
15. a. Find the condition under which two quadratic equation may have one root common (2)
    b . Find the nth term of the series 1+3+6+10…..…. (3)
16. a. Find $\frac{dy}{dx}$ of $e^{\sin hx}$ (2)
    b. Verify Roller's theorem for the function $f(x)=x(x-3)^2$ for $x\in[0,3]$ (3)
17. a. Using L Hospital's rule,
    Evaluate : $\lim_{x\to 0}\frac{x-\sin x}{x^3}$. (2)
    b . Prove that the tangents to the curve.
    $y=x^2-3x+4$ at (1,2) and (2,1) are perpendicular to each other. (3)
18. a. Evaluate $\int\frac{dx}{x^2+6x+8}$ (2)
    b. Integrate $\int\frac{13}{(3x+4)(4x+1)}dx$ (3)
19. a. Prove that $\sin^{-1}x+\cos^{-1}x=\frac{\pi}{2}$ (2)
    b. Integrate $\int\sqrt{4x^2-4x+5}\,dx$. (3)

Group 'C' 3×8=24

20. Define permutation show that the number of ways in which the letters of the word "COLLEGE" can be arranged so that two E's always come together is 360. From 6 gentlemen and 4 ladies, a commute of 5 is to be formed. In how many ways can this be done so as to include at least one lady? 1+3+4
21. define binomial expression. Show that the middle term of the expansion of $(1+x)^{2n}$ is $\frac{1.3.5.....(2n-1)}{n!}2^nx^n$. Prove that $\sum_{n=1}^{\infty}\frac{n^2}{(n+1)!}=e-1$. 1+3+4.
22. State mean value theorem. Geometrical interpretation to it and find the derivative of $\cos^{-1}x$ form first principal.

OR

Define derivative and anti-derivative with examples. State Rolle's

theorem and Evaluate $\int \frac{dx}{2\sin x+3\cos x}$ 2+2+4

23. a. Prove by the method of induction that $1.3 + 2.4 + 3.5 + \cdots + n(n+2) = \frac{n(n+1)(2n+7)}{6}$ (4)

b. Use row equivalent matrices or Cramer's rule to solve the system:

$x-y+z=-3$

$x-y-z=1$

$3x-4y-z=1$

**** The End ****