Basic Mathematics Aptitude Test

(Full score: 40)

Please Note:

➢ You have 60 minutes to complete.

➢ No calculators are allowed.

➢ Please show all your work and write your answers in the designated space.

Thank you.

Country:_____

Reference Number:_____

Name:_____

Reference Number: Name:

(**Please show all your work here and write your answers in the designated space.**)

Answer the following questions (2 point for each question):

1. Calculate the following: $2\frac{5}{14} \div \left\{2\frac{1}{4} \times \left(2\frac{3}{7} - 1\frac{2}{9}\right) - 1\frac{27}{35}\right\}.$

Answer: _____

2. Calculate the following: $\log_2 2\sqrt{6} - \log_2 \sqrt{3}.$

Answer: _____

3. Solve for x in the following equation.
$$(\log_2 x)^2 - \log_2 x^3 - 4 = 0$$

Answer: _____

4. Obtain the approximate value for x in the following equation using $\log_e 55 \cong 4$.

$$55^x = e^{x-1}$$

Answer: _____

5. Solve for x in the following equation.

$$0.2x^2 + 1.2x + 1.6 = 0$$

Answer: _____

6.   Solve for (x, y) in the following two simultaneous equations.

$$\begin{cases} 2x + y = 3 \\ 3x - y = 7 \end{cases}$$

Answer: _____

7.   Find the total derivative dz/dy, given $z = (x + y)(x - 2y)$ where $x=2\text{-}7y$.

Answer: _____

8. Find the natural number(s) of x that satisfy the following inequality: $x^2 - 5x + 4 < 0$.

Answer: _____

9. Given the three sets $S_1 = \{2, 4, 6\}$, $S_2 = \{2, 6, 7\}$, and $S_3 = \{4, 6\}$, find:
$$(S_1 \cup S_2) \cap S_3,$$
where $\cup$ and $\cap$ denote union and intersection of sets, respectively.

Answer: _____

10. Two dice are rolled; find the probability that the sum is equal to 6.

Answer: _____

11. A random variable X can take only three values, 1, 2, and 3. And probabilities are given as Pr(X=1)=0.5, Pr(X=2)=0.3, and Pr(X=3)=0.2, respectively. Calculate the Expected value of X.

Answer: _____

Reference Number: Name:

12. Find the first derivative of the following function.
$$y = x\log_e x$$

Answer: _____

13. Find the quadratic approximation of the following function at the point *x*= 0.
$$f(x) = 2\log_e(1 + x)$$

Answer: _____

14. Evaluate the following integral. $\int_0^1 (1 - x^2)dx$

Answer: _____

15. Evaluate the following sum. $2 + 4 + 6 + 8 + \cdots + 100$

Answer: _____

Reference Number: Name:

16. Find the local maximum of the following function (Find both (*i*) the critical point (*x,y*) that maximizes the function and (*ii*) the maximum)**.**

$$f(x, y) = 1 - 2x^2 - y^2$$

Answer: _____

17. Find the solution of the following constrained maximization problem (Find both (*i*) the critical point (*x,y*) that maximizes the function and (*ii*) the maximum)**.**

$$\max_{x,y} f(x, y) = xy^2 \text{ subject to } 2x + 4y = 8.$$

Answer: _____

18. Given a matrix $X = \begin{pmatrix} 1 & -1 \\ 1 & 0 \\ 1 & 2 \end{pmatrix}$**, find the matrix X'X.**

Answer: _____

Reference Number: Name:

19. Find the solution of the following equation system.

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 3 & -3 \\ -3 & 5 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} + \begin{pmatrix} 1 \\ -1 \end{pmatrix}$$

Answer: _____

20. What is the present value (PV) of an investment that will pay \$400 in one year's time, and \$400 every year after that, when the annual interest rate is 5%?

Answer: _____