KATHMANDU UNIVERSITY
End Semester Examination
May/June 2022

Mark Scored:

Level : B.Arch.
Year : I
Course : MATH 106
Semester: II

Exam Roll No. :
Time: 30 mins.
F.M. : 20

Registration No.:
Date :

SECTION "A"
[10Q × 1 = 10 marks]

Fill in the blank space (s) by most appropriate word (s) or symbol (s).

1. If X is the true value of the quantity and X_1 is the approximate value then the relative error is E_R = _____ and percentage error is E_P = _____.

2. If X is the true value and X_1 is the approximate value of the given quantity then its absolute error is E_A = _____ and relative is error in terms of absolute error is E_R = _____.

3. After rounding of the number 3.5782 to the two decimal places, we get the number _____.

4. $\Delta tan^{-1}(x) =$ _____.

5. Coefficient of variation of a random variable distributed as Poisson with parameter λ is _____.

6. _____random variable takes infinite number of possible values that are not countable.

7. The probability of not rolling any 6's in four rolls of a balanced die is _____.

8. Let Y be a continuous random variable where $f(y) = \begin{cases} ky + 5 & if \quad 0 \leq y \leq 10 \\ 0, otherwise \end{cases}$
Then k = _____.

9. Let Y be a continuous random variable where $f(y) = \begin{cases} \frac{1}{18} \; if -3 \leq y \leq 15 \\ 0, otherwise \end{cases}$
Then for $-3 \leq y \leq 15$, the distribution function F(y) = _____.

10. For the given distributed data the value of Δ^3 y0 is _____.

x	3.60	3.65	3.70	3.75
y	36.598	38.475	40.447	42.521

SECTION "B"

[10Q × 1 = 10 marks]

Encircle the most appropriate option.

11. Rounding off the number 52.78673 to 4 significant digits, we get a number _____.
    a. 52.78 b. 52.79 c. 52.67 d. 52.786

12. In bisection method if roots lies between a and b then $f(a) \times f(b)$ is _____.
    a. < 0
    b. $= 0$
    c. > 0
    d. none of these

13. If percentage error of a number is $5.364 \times 10\text{-}4$ then its relative error is _____.
    a. 5.364×10^{-5}
    b. 5.364×10^{-6}
    c. 5.364×10^{-7}
    d. none of these

14. $1 + \Delta =$ _____.
    a. E -1 b. ∇ c. E d. δ

15. The process of finding the values inside the interval (X_0, X_n) is called _____.
    a. Interpolation
    b. Extrapolation
    c. Iterative
    d. Polynomial equation

16. In Newton Raphson method for finding the real root of equation $f(x) = 0$, the value of x is given by _____.
    a. $x_0 - \frac{f(x_0)}{f'(x_0)}$
    b. x_0
    c. $\frac{f(x_0)}{f'(x_0)}$
    d. none of these

17. Describe a sample space of associated with flipping a coin until either heads or tails occur twice _____.
    a. {HHT, THH, HTH, TT, HTT, THT}
    b. {HH, THH, HTHT, TT, HTT, THT}
    c. {HH, THH, HTH, TT, HTT, THT}
    d. {HH, THH, HTH, TT, TTH, THT}

18. The expected values of number of sales of household appliances Y made in a day, given by following probability distribution is _____.

y	0	1	2	3	4	5
$p(y)$	0.10	0.28	0.18	0.11	0.16	0.17

    a. 0.41 b. 1.45 c. 3.45 d. 2.46

19. The expected value of a discrete random variable _____.
    a. is the outcome that is most likely to occur.
    b. can be found by determining the 50% value in the c.d.f.
    c. equals the population median.
    d. is computed as a weighted average of the possible outcome of that random variable, where the weights are the probabilities of that outcome.

20. Let Y be a random variable. Then $V(Y)$ equals .....
    a. $\sqrt{E(Y - \mu_Y)^2}$
    b. $E(|Y - \mu_Y|)$
    c. $E(Y - \mu_Y)^2$
    d. $E(Y - \mu_Y)$

KATHMANDU UNIVERSITY
End Semester Examination
May/June 2022

Level : B.Arch.
Year : I
Time : 2 hrs. 30 mins.

Course : MATH 106
Semester: II
F.M. : 55

SECTION "C"
[3Q × 7 = 21 marks]

1. For the annual rainfall data in inches given below, do the following. [2+2+2+1]
   a. Construct the stem and leaf plot for these data and find the quartiles.
   b. Construct the histogram of these data
   c. Construct the box plot of these data
   d. Interpret the box plot

0.2	3.7	1.2	13.7	1.5	0.2	1.7
0.6	0.1	8.9	1.9	5.5	0.5	3.1
3.1	8.9	8.0	12.7	4.1	0.3	2.6
1.5	8	4.6	0.7	0.7	6.6	4.9
0.1	4.4	3.2	11	7.9	0.0	1.3
2.4	0.1	2.8	4.9	3.5	6.1	0.1

2. Consider the density function $f(x) = \begin{cases} \frac{1}{k} - 3 \leq x \leq 15 \\ 0, \text{elsewhere} \end{cases}$ [1+3+3]
   a. Evaluate k
   b. Find E(X) and σ_x
   c. Find the CDF and use it to evaluate P[.3<X<.6]

3. Prove the following relations: [5Q × 1.40 = 7]
   a. $\delta^2 E = \Delta^2$
   b. $E^{-1/2} = \mu - \frac{\delta}{2}$
   c. $\nabla = \delta E^{-1/2}$
   d. $\Delta - \nabla = \delta^2$
   e. $\mu\delta = \frac{\Delta+\nabla}{2}$

SECTION "D"
[6Q × 4 = 24 marks]

4. The number of holes that can be drilled per bit while drilling into limestone is given in the table below. [1+1+2]

X	1	2	3	4	5	6	7	8
$f(X)$	0.02	0.03	0.05	0.2	0.4	0.2	0.07	?

a) Find $E[X]$
b) Find σx?
c) Find the Cumulative Distribution Function $F(x)$

5. Identify the type of data. Choose from nominal, ordinal, interval and ratio.
   a. Anxiety rate on a scale of 1 to 5 where 1 equals not anxious, 3 equals moderately anxious and 5 equals highly anxious
   b. Gender
   c. Weight of an individual
   d. Number of adults (above 18 years) living in a family
   e. Temperature in ^0C
   f. pH of any water soluble substance is
   g. Stability of the house during earthquake on a scale of 1 to 5 where 1 equals not stable, 3 equals moderately stable and 5 equals highly stable
   h. Bulk density of soil

6. Of all registered automobiles in a certain state, 10% violate the state emission standard. Twelve automobiles are selected at random to undergo an emission test.
   a. Find the probability that exactly three of them violate the standard
   b. Find the probability that fewer than three of them will violate the standard
   c. Find the probability that none of them will violate the standard

7. Given the equation $xlog10(x) - 1.2 = 0$

   Find the root between 2 and 3 correct to three decimal places using Newton's Raphson's method.

8. Math scores are each distributed normally with N (μ,σ^2), where $\mu = 500$, $\sigma^2 = 10{,}000$
   a. What fraction of students scores above 750?
   b. Between 420 and 530? c) Above 480

9. Find f(2) and f(8) from the following table using Newton's forward and backward difference formula. [2+2]

x	1	3	5	7
y	24	120	336	720

SECTION "E"
[5Q × 2 = 10 marks]

10. If true value of a number is 56.25 and its absolute error is 0.002. Find the relative error and percentage error.

11. If the absolute error is 0.005 and relative error is 5.264 × 10-6, then find the true value and percentage error.

12. Let Y be a continuous random variable where, $F(x) = \begin{cases} 0, & x < 3 \\ \frac{x+3}{18}, & -3 \le x < 15 \\ 1, & x \ge 15 \end{cases}$

    Find $P(-2 < X < 9)$

13. Find the value of x from the first iteration using iteration method for the equation $x = 0.21\sin(0.5 + x)$

14. Let Z be a standard normal variate. Find the probability P (-2.3 < Z < 1.4)