KATHMANDU UNIVERSITY
End Semester Examination [C]
January 2025

Marks Scored:

Level : B.Arch
Year : I

10 JAN 2025

Course : MATH 106
Semester : II

Exam Roll No. :

Time: 30 mins.

F. M. : 20

Registration No.:

Date :

SECTION "A"
[10 Q. × 1 = 10 marks]

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

1. Educational level "High School", "Bachelors", "Masters", "PhD" is an example of _____ scale.

2. For deciles, the total number of partition values are _____.

3. Which measurement scale allows for construction of meaningful ratio due to a fixed zero point? _____.

4. Average wages of workers of a factory are Rs. 550 per month and SD of wages is 110. The coefficient of variation is _____.

5. A graphical representation of groups of data through quartiles is called_____.

6. Every polynomial equation of the nth degree has _____ roots.

7. How many parameters in the binomial distribution? _____.

8. If the parameter of a Poisson distribution is λ, then its standard deviation is _____.

9. If $\mu = 6000, \sigma = 100$ then for $x = 6250$, the value of z is _____.

10. Suppose a number x is chosen from the numbers -2, -1, 0, 1, 2. What will be the probability of $x^2 > 0$? _____.

SECTION "B"
[10 Q.× 1 = 10 marks]

Fill in the blank space(s), **DO NOT TICK**, by selecting the most appropriate answers from among the given ones.

11. Which measurement scale allows for meaningful intervals between measurements but doesn't have a true zero point?_____
[Nominal Ordinal Interval Ratio]

12. Two people X and Y apply for a job in a company. The probability of the selection of X is 2/5, and Y is 4/7. What is the probability that both of them get selected?_____
[1/6 27/35 8/35 3/35]

13. Rounding off the number 27.97450 to five significant figures will give you _____
[24.9 24.974 24.97 None]

14. Iteration method is a _____ method.
[direct indirect self correcting step by step]

15. The forward difference operator is denoted by the symbol _____.
[Δ ∇ ∂ ∞]

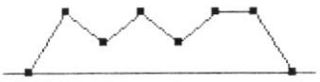
16. The equation f(x) is given as $x^3 - x^2 + 4x - 4 = 0$. Considering the initial approximation at x =2 then the value of next approximation corrected up to 2 decimal places is given as _____
[0.67 1.33 1.00 1.50]

17. In normal distribution for any $z_1 > 0$, $P(-z_1 < z < 0)$ _____ $P(0 < z < z_1)$.
[$>$ $<$ $=$ $\neq$]

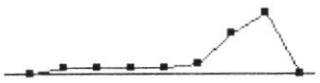
18. Frequency polygon with a large negative skew is _____.
[A B C None of these]

A.

B.



C.



19. A perfectly normal distribution: _____
[Is bell shaped, symmetrical and has tails that cross the x-axis at infinity
Is only applicable for normal people
Has equal mean, median and modes
(a) and (c) above]

20. A card is drawn from a pack of 52 cards. What is the probability that it is a face card (King, Queen, and Jack only)? _____.
[1/26 2/13 1/13 3/13]

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F. M. : 55

SECTION "C"
[3Q. × 7 = 21 marks]

Attempt *All* questions.

1. Following are the following data of seed yields from plants. [1+1+1.5+1.5+2]

Seed Yield (gm)	No. of Plants
2.5-3.5	4
3.5-4.5	6
4.5-5.5	10
5.5-6.5	26
6.5-7.5	24
7.5-8.5	15
8.5-9.5	10
9.5-10.5	5

a. Compute the mean concentration.
b. Compute the median concentration.
c. Compute the first quartile of the concentrations.
d. Compute the third quartile of the concentrations
e. Construct a box plot for the concentrations. What features does it reveal?

2. Compare root finding process of Newton – Raphson and Iteration Method. Also find the root of the equation $xe^x=1$, using Newton Raphson and Iteration Method. Also compare the results. [2+4+1]

3. A random variable has probability density function given by [2+2+2+1]

$$f(x) = 3e^{-3x}; x > 0$$

a. Find the mean concentration
b. Find the cumulative distribution function F(X)
c. What is the probability that X is not less than 4?
d. What is the probability that X is between 4 and 6

SECTION "D"
[6Q. × 4 = 24 marks]

4. Distribution of height of 1000 soldiers is normal with mean 165 cm & standard deviation 15 cm. How many soldiers are of height between 138 & 198 cm? How many soldiers have height less than 160? [2+2]

5. Of all the registered automobiles in a certain state, 10% violate the state emission standard. Twelve automobiles are selected at random to undergo an emission test. [2+2]
a. Find the probability that exactly three of three violate the standard
b. Use Poisson approximation to binomial distribution for the sum a)

P.T.O.

6. At a machine center there are four automatic screw machines. An analysis of past inspection of records yields the following data. [2+2]

Machine	Percent Production	Percent Defectives Produced
1	15	4
2	30	3
3	20	5
4	35	3

Machine 2 and 4 are newer and more production has been assigned to them than to machines 1 and 3. Assume that the current inventory mix reflects the production percentages indicated.

a. If a screw is randomly picked from inventory, what is the probability that it will be defective?

b. If a screw is picked and found to be defective, what is the probability that it was produced by machine 3.

7. A discrete random variable X has probability function px(x) where

$px(x) = k\left(\frac{1}{2}\right)^x$, x = 1, 2, 3 [1+2+1]

= 0, otherwise

a. Find k

b. Find the cumulative distribution function FX(x)

c. Find the Expectation and Variance

8. Find the root of x^4-x-10 = 0 approximately up to 5 iterations using Bisection Method. Let a = 1.5 and b = 2.

9. The following data gives the melting point of an alloy of lead and zinc where 't' is the temperature in degree c and P is the percentage of lead in the alloy

P	40	50	60	70	80	90
T	180	204	226	250	276	304

Find the melting point of the alloy containing 84 percent lead.

SECTION "E"

[5 Q.× 2 = 10 marks]

10. Evaluate $\Delta^2 x^3$

11. What is "n" for the binomial distribution for which mean is 10 and variance is 5?

12. Find a real root of $f(x) = x^3 + x^2 + x + 7$ correct to three decimal places using bisection method. Test till four iteration

13. You measure two quantities as $A = 1m \pm 0.02m$, $B = 1m \pm 0.02m$. Compute the correct value of $\sqrt{AB}$ including the margin of errors.

14. The yield and plant height of a paddy variety are given, the mean and standard deviation for yield are 50 kg and 10 kg respectively. The mean and standard deviation for plant height are 55 am and 5 cm respectively. Compare the variability among yield and plant height.