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CS.c108-2069

Tribhuvan University

Institute of Science and Technology

2069

Full Marks: 80
Pass Marks: 32
Time: 3 hours

Bachelor Level/ First Year / First Semester/ Science
Computer Science and Information Technology MTH.104
(Statistics I)
Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group A

Attempt all questions. **[10×2=20]**

1. Verify the mean value theorem for the function $f(x)=\sqrt{x(x-1)}$ in the interval [0,1].
2. Find the length of the curve $y=\frac{4\sqrt{2}}{3}x^{3/2}-1$ for 0≤x≤1.
3. Test the convergence of the series $n=1\sum^{\infty}\frac{1}{n!}$ by comparison test.
4. Obtain the semi-major axis, semi-minor axis, foci, vertices $\frac{x^2}{25}+\frac{y^2}{16}=1$.
5. Find the angle between the vectors 2i+j+k and -4i+3j+k.
6. Obtain the area of the region R bounded by y=x, and y=x^2 in the first quadrant.
7. Show that the function

$$f(x,y)=\begin{cases}\dfrac{2xy}{x^2+y^2} & (x,y)\neq(0,0)\\ 0 & (x,y)=(0,0)\end{cases}$$

is continuous at every point in the plane except the origin.

8. Using partial derivatives, find $\frac{dy}{dx}$ *if* $2xy+\tan Y-4y^2=0$.
9. Verify that the partial differential equation $\frac{\partial^2 z}{\partial x^2}-\frac{\partial^2 z}{2y}=\frac{2z}{x}$ is satisfied by $z=\frac{1}{x}Ø(y-x)+Ø'(y-x)$.
10. Find the general solution of the equation

$$x^2 \frac{\partial z}{\partial x} + y^2 \frac{\partial z}{\partial y} = (x+y)z.$$

Group B [5×8=40]

11. State and prove mean value theorem for definite integral.
12. Find the area of the region that lies in the plane enclosed by the cardioids r=2 (1+cosθ).
13. What do you mean by principal unit normal vector? Find unit tangent vector and principal unit normal vector for the circular motion $\overline{r}(t) = (\cos 2t)i + (\sin 2t)j$.
14. Define partial desivative of a function f(x,y) with respect to x at the point (x_0,y_0). State Euler's theorem, verity it for the function

    $F(x,y) = x^2 + 5xy + \sin x + 7e^x x = (y/2) + 1.$
15. Find a particular integral of the equation

    $$\frac{\partial^2 z}{\partial x^2} - \frac{\partial z}{\partial y} = 2y - x^2.$$

Group C **[5×8=40]**

16. Graph the function $y = x^{5/3} - 5x^{2/3}$
17. What is meant by Machaurin series? Obtain the Maclaurin series for the function $f(x)=e^{-x}$.
18. Evaluate the double integral $\int_0^4 \int_{x=y/2}^{x=\frac{4}{2}+1} \frac{2x-y}{2}$ dxdy by applying the transformation u=$\frac{2x-y}{2}, v = \frac{y}{2}$ and integrating over an appropriate region in the uv-plane.
19. Define maximum and minimum of a function at a point. Find the local maximum and local minimum of the function $f(x,y)= 2xy-5x^2-2y^2+4x+4y-4$.

    OR

    Find the volume of the region D enclosed by the surface $z=x^2+2y^2$ and $z=8-x^2$-y2.
20. Find the solution of the equation

    $$\frac{\partial^2 z}{\partial x^2} - \frac{\partial^2 z}{\partial y^2} = x - y$$

    OR

    Find the particular integral of the equation $(D^2-D')z=2y-x^2$.

    Where $D = \frac{\partial}{\partial x}, D' = \frac{\partial}{\partial y}$

CS.c102-2069

Tribhuvan University

Institute of Science and Technology

2069

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Bachelor Level/ First Year / First Semester/ Science
Computer Science and Information Technology (CS.c 102)
(Fundamental of Computer Programming)
Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all questions.

1. What an algorithm and flow chart to find out whether a given integer is zero, +ve or –ve and explain it.

2. What are the basic four data types use in C programming? What are its size and range? Explain.

3. Explain the "if ….. else" statement with example.

4. Differentiate between break and exit statement with example.

5. Explain the multidimensional array with example. Write a program to convert a lowercase character string into uppercase.

6. Explain the library functions with example.

7. Write a program to find the sum of all the elements of an array suing pointers.

8. Explain the pointer arithmetic with example.

9. Explain the array of structures and write a program to accept record of 15 person which has name, age and address and also display them.

10. What are the three of input / output functions which support in C- programming? Explain with example.

OR

Write short notes on:

a) Delimiters

b) Graphics function

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CS.c101-2069

Tribhuvan University

Institute of Science and Technology

2069

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Bachelor Level/ First Year / First Semester/ Science
Computer Science and Information Technology (CS.c 101)
(Introduction to Information Technology)
Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Long Questions:

Attempt any two questions: **[2×10=20]**

1. Mention the different categories of digital computers and compare it.

2. Explain the different types of database management systems with example.

3. Explain the different type of modulation with suitable figure.

Short Questions:

Attempt any eight questions: **[8×5=40]**

4. What are the major components of a computer?

5. What are the different types of software used in the computer systems?

6. What are the major characteristics of data in a database?

7. What do you mean by normalization?

8. What are the major components of a computer networks?

9. What are the major advantages of distributed data processing?

10. What are the different protocols available on the Internet?

11. How does an email work?

12. What do you mean by Intranet?

13. What do you mean by office automation systems?

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CS.c103-2069

Tribhuvan University

Institute of Science and Technology

2069

Full Marks: 60
Pass Marks: 24
Time: 3 hours

Bachelor Level/ First Year / First Semester/ Science
Computer Science and Information Technology stat. 103
(Probability and Statistics)
Candidates are required to give their answers in their own words as far as practicable.
All notations have the usual meanings.

Attempt any Two: **[2×10=20]**

1. Write the algebraic computation expressions for mean and standard deviation based on a given sample x_1, x_2 …., x_n. Why they are important in statistics? Write down their properties compute the mean and standard deviation from the following scores of 10 students.

45	55	35	60	55	55	65	40	45	35

2. Explain the terms – sample space and an event of a random experiment. State the classical and the statistical definition of probability. Which of the two definitions is most useful in statistics and why? If A,B and C are events of a sample space such that
$P(A)=0.5$, $P(A \cap C)=0.2$, $P(A \cap B^c \cap C^c)=0.1$, and $(A \cap B \cap C)=0.05$, using Venn-diagram find $P(A \cap B)$.

3. A large company wants to measure the effectiveness of newspaper advertising media on sale promotion of its products. A sample of 22 cities with approximately equal populations is selected for study. The sales of the product (Y) in thousand Rs and the level of newspaper advertising expenditure (X) in thousand Rs are recorded for each of the 22 cities (n) and the recorded sum, sum of square, and sum of cross product of X and Y are summarized below.

$$\sum Y = 26953,\ \sum X = 660,\ \sum Y^2 = 35528893,\ \sum X^2 = 22700, \&\ \sum YX = 851410$$

Using the above summary results:

a) Compute correlation coefficient r between X and Y, and coefficient of determination.
b) Fit a simple linear regression model of Y on X using least square method and interpret the estimated slope regression coefficient.

Group B

Answer any eight questions: [8×5=40]

4. Write down the role of probability theory in statistics with suitable examples.

5. Explain discrete and continuous random variables with suitable examples, Suppose a continuous random variable X has the density function.

$$f(x) = \begin{cases} kx^2 & \text{if } -1 < x < 2 \\ 0 & \text{otherwise} \end{cases}$$

Find (a) value of the constant k, and (b) find E(X).

6. Suppose that X and Y have joint density function

$$f(x,y)=\begin{cases}4xy & \text{If } 0<x<1 \text{ and } 0<y<1\\ 0 & \text{otherwise}\end{cases}$$

Find (a) marginal densities of X and Y, (b) P(X≤0.3) and (c) P(Y≥0.5).

7. In a binomial distribution with parameters n and p derive the mean and variance of the distribution.

8. If $X_1, X_2, \ldots\ldots X_n$ are n independent Poisson random variables with common mean λ, derive the maximum likelihood estimator of λ. Show that the estimator is unbiased for λ.

9. If $Z_1, Z_2, \ldots\ldots, Z_n$ are n independently distributed standard normal variants, what is the distribution of $\sum_{i=1}^{n} Z_i^2$?

Write down the density function of $\sum_{i=1}^{n} Z_i^2$ and mention its properties.

10. If a contiguous random variable X has exponential distribution with density function

$$f(x)=\begin{cases}\lambda e^{-\lambda x} & \text{for } x>0\\ 0 & \text{otherwise}\end{cases}$$

For h>0, prove that P(X>t+h/X>t)=P(X>h), and hence prove that P(X>t+h)=P(X>t)×P(X>h).

11. If a random variable X is normally distributed with a mean of 120 and a standard and a standard deviation of 12. Compute the following probabilities: (a) P (X>130), (b) P(X<115), and (c) P(110<X<130).

12. A manufactures of TV sets claims that the average life of its picture tubes is at least 10 years. A sample survey of 100 of the picture tubes showed an average of 9.6 years and a standard deviation of 2.6 years. Do these results cast doubt on the claim of manufacturer? Answer this question by setting appropriate null and alternative hypotheses and testing the null hypothesis at 5% level of significance.

13. The Chamber of Commerce claims that the mean carbon dioxide level of air pollution is no more than 4.9 ppm. A random sample of 16 readings resulted mean equal to 5.6 ppm and standard deviation equal to 2.1 ppm. Assuming that the carbon dioxide level is normally distributed, is there evidence against the Chamber of Commerce's claim? Answer the query by setting appropriate null and alternative hypotheses and testing the null hypothesis at 5% level of significance.

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Bachelor Level/ First Year / First Semester/ Science
Computer Science and Information Technology stat. 108
(Statistics I)
Candidates are required to give their answers in their own words as far as practicable.
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Group A

Attempt any Two: **[2×10=20]**

1. Describe simple random sampling with and without replacement for drawing a random sample of size n from a population of size N. In both cases show that sample mean is unbiased estimate of the population mean. Derive the variance of the sample mean in both cases. If V_{srswr} and V_{srswor} correspondingly denote that variance of sample mean under simple random sampling with and without replacement method, then show that

$$\left(V_{srswr} - V_{srswor}\right) = \frac{n-1}{Nn} S^2$$

and write conclusion that you can draw out of the above result.

2. Describe function and method of sign test. A study was designed to determine the effect of a certain movie on the moral attitude of young children. The data below represent a rating from 0 to 20 on a moral attitude scale recorded before and after viewing the movie, where high score associated to high morality. Carry out the test of hypothesis that movie had no effect on moral attitude of children against it had using sign test at level 0.1.

Before	14	16	15	18	15	17	19	17	17	16	14	15
After	13	18	16	17	16	19	20	18	19	15	18	16

3. A sample of n=22 data points was used to estimate β_0, β_1 and β_2 of the multiple regression model: $Y=\beta_0+\beta_1X_1+\beta_2X_2+u$, where Y=sales of the product in thousand Rs, X_1=radio advertising expenditure in thousand Rs and X_2=newspaper advertising expenditure in thousand Rs. The available estimates of parameters and their standard errors are summarized below:

	β_0	β_2	β_2
Estimate	156,43	13.08	16.80
Standard error	126,76	1.76	2.96

a) Write the edstimated regression model and interpret the coefficients of X_1 and X_2

b) Predict the value of Y when X_1=75 and X_2=50

c) Further computation shows that $\sum(Y_1 - \overline{Y})^2 = 2507793$ and $\sum(Y_i - \hat{Y})^2 = 479760$.

Based on this result compute R^2 and carry out overall significance test of the model.

d) Carry out the test $H_0{:}\beta_1=0$ against $H_1\beta_1>0$.

Group B

Answer any eight questions: [8×5=40]

4. In a stratified random sampling, if the cost of survey is constant for each stratum then derive an expression for n_h under optimum allocation.

5. Describe in detail two-stage sampling method. Obtain an expression for an unbiased estimator of population total when samples were drawn by adopting simple random sampling without replacement method, and what would be the expression of this unbiased estimator if M_i=M and m_i=m for all i?

6. Define a run. A true-false examination constructed with the answers running in the following sequence.

TFFTFTFTTFTFFTFTFTTF

Does this sequence indicate a departure from randomness in the arrangement of T and F answers? Critical region at 5% level of significance is $R \leq 6$ pt $R \geq 16$ where R=number of runs.

7. A survey of voter sentiment was conducted in four wards to compare the fraction of voters candidates A, Random samples of two hundred voters were polled in each of the four wards with result as shown below

	Ward			
	1	2	3	4
Favor A	76	53	59	48
Do not Favor A	124	147	141	152

Do the data present sufficient evidence to indicate that the fraction of voters favoring candidate A differ in the four wards? Use chi=square test at 5% level.

8. The final scores obtained by two groups of students, where students of group A were taught using method A and those of group B were taught using method B, are summarized below. Use Mann Whitney test to determine whether or not the final exam scores of two groups are different.

Group A	55	59	61	64	64	70	73	75	76	82	83	95
Group B	65	77	80	84	86	88	91	91	91			

9. Describe rationale and method of Median test test.

10. Describe the method of estimation of the parameters α and β of the growth model $Y_t = \alpha e^{\beta t}$, when the values of Y_t are available for t=1,2,….,n? What does the estimated β measure?

11. Describe the method of formulation a multiple regression model when the dependent variable Y is binary in nature.

12. Write a suitable multiple regression model if the dependent variable (Y) is output and one independent variable (X_1) is labor input and other independent variable (X_2) is capital input. Describe the properties of the model.

13. Define multiple correlation coefficient, If r_{12}=0.679, r_{13}=0.502 and r_{23}=-0.092, then compute R1.23, where rij is the simple correlation coefficient between X_1 and X_2 and X_3.

14. What is autocorrelation? How do you estimate and test it?