eduNEPAL•info

*A Guide to eduRealm in NEPAL*

www.edunepal.info

facebook.com/edunepal.info

@ edunepal_info

# Tribhuvan University
# Institute of Science and Technology
# 2068

Bachelor Level/First Year/First Semester/Science
Computer Science and Information Technology – MTH.104
(Calculus and Analytical Geometry)

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

Candidates are required to give their answer in their own words as for as practicable.
The figures in the margin indicate full marks.
Attempt all questions. (10×2=20)

## Group A

1. Define one-to one and onto functions with suitable examples.
2. Show by integral test that the series.

   $\sum_{n=1}^{\infty} \frac{1}{x^p}$ converges if p>1.
3. Test the convergence of the series $\sum_{n=1}^{\infty} (-1)^{x+1} \frac{1}{x^2}$.
4. Find the focus and the directrix of the parabola $y^2=10x$.
5. Find the point where the line

   $x = \frac{8}{3} + 2t, \ \ y = -2t, \quad z = 1 + t$

   intersects the plan 3x+2y+6z=6
6. Find a spherical coordinate equation for the sphere.

   $x^2+y^2+(z-1)^2=1$
7. Find the area of the region R bounded by y=z and $y=x^2$ in the first quadrant by using double integrals.
8. Define Jacobian determinant for

   x=g(u,v,w), y=h(u,v,w), z=k(u,v,w).
9. Find the extreme values of $f(x,y)=x^2+y^2$.
10. Define partial differential equations of the second order with suitable examples.

## Group B

11. State Rolle's theorm for a differentiable function support with examples that the hypothesis of theorem are essential to hold the theorem.
12. Test if the following series converse.

    $(a) \sum_{n=1}^{\infty} \frac{x^2}{2^x}$ $(b) \sum_{n=1}^{x} \frac{2^x}{x^2}$
13. Obtain the polar equations for circles through the origin centered on the x-and y-axis and radius a.
14. Show that the function

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

    is continuous at every point except the origin.
15. Find the solution of the equation

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

Group C (5×8=40)

16. Find the area of the region enclosed by the parabola $y=2-x^2$ and the line $y=-x$.

OR

Evaluate the integrals

$(a)\int_0^3 \frac{dx}{(x-1)^{2/3}}$ $(b)\int_{\infty}^{\infty} \frac{dx}{1+x^2}$

17. Define a curvature of a space curve. Find the curvature for the helix.

    $r(t)=(a\cos t)i+(a\sin t)j + btk$ $(a,b\geq 0, a^2+b^2+\neq 0)$.

18. Find the volume of the region D enclosed by the surfaces $z=x^2+3y^2$ and $z=8-x^2-y^2$.

19. Find the maximum and minimum values of the function $f(x,y)=3x+4y$ on the circle $x^2+y^2=1$.

OR

State the conditions of second derivative test for local extreme values. Find the local extreme values of the function $f(x,y)=x^2+xy+y^2+3x-3y+4$.

20. Define one-dimensional wave equation and one-dimensional hear equations with initial conditions. Derive solution of any one of them.

Tribhuvan University

Institute of Science and Technology

2068

Bachelor Level/First Year/First Semester/Science

Computer Science and Information Technology (CSc.102)

(Fundamental of Computer Programming)

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

Candidates are required to give their answer in their own words as for as practicable.

All questions carry equal marks.

Attempt all questions:

1. What an algorithm and flow chart to determine whether a given integer is odd or even and explain it.
2. How can you declare the variable in C? Explain with example.
3. Write a program to find the factorial of a given integer.
4. Explain switch statement with example.
5. Write a program to find the largest and smallest among the given elements in an array.
6. Explain the user-defined functions and its types with example.
7. Write a program to accept to numbers and sort them with using pointer.
8. Explain the passing structure to function with example.
9. Write a program to accept any number and print the sum of that number up to a single digit through recursive function.
10. Explain the pointer to structure with example.

OR

Write short notes on:

a) Dynamic memory allocation
b) Opening and closing file

Tribhuvan University

Institute of Science and Technology

2068

Bachelor Level/First Year/First Semester/Science

Computer Science and Information Technology (CSc.101)

(Introduction to Information Technology)

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

Candidates are required to give their answer in their own words as for as practicable.

The figures in the margin indicate full marks.

Long Question:

Attempt any two questions: (2×10=20)

1. Explain how the CPU and memory work with suitable diagram. Compare between CISC and RISC architecture in brief.
2. Differentiate between centralized Data processing system and Distributed Data Processing System. State advantages and disadvantages of distributed systems.
3. Explain about Internal and Intranet. List some activities that you can do on the Internet. Describe, how the world wide web is different form the Internet?

Short Questions:

Attempt any eight questions (8×5=40)

4. Distinguish among the four kinds of computer systems.
5. Define RAM, ROM, PROM, EPROM.
6. What are the features of today's software applications? Explain.
7. What is the difference between sequential and direct-access file processing?
8. Explain the meaning of up-link, down-link and cross-link.
9. How will you compose, reply and forward an e-mail message?
10. What is GIS? What are the components of GIS? How GIS works?
11. Explain CAD / CAM system.
12. Highlight on Computers in Education and training in brief.
13. Write short notes on (any two):
    a) Compiler and interpreters
    b) MICR, OCR and OMR
    c) Data Normalization

# Tribhuvan University
# Institute of Science and Technology
# 2068

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

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

## Group A

Attempt any Two: (2×10=20)

1. Define the following three measures of dispersion-range, standard deviation and inter-quartile range-by clearly state their properties. Write down a situation where range is preferred to standard deviation. Score obtained by 10 students in a test are given below. Compute range, and standard deviation.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 42 | 55 | 35 | 60 | 55 | 55 | 65 | 40 | 45 | 35 |

2. Three are three traffic lights on your way home. As you arrive at each light assume that it is either red (R) or green (G) and that it is green with probability 0.7. Construct the sample space by listing all possible eight simple events. Assign probability to each simple event. Are the events equally likely? What is the probability that you stop no more than one time.
3. A large company wants to measure the effectiveness of radio advertising media (X) on the sale promotion (Y) of its products. A sample of 22 cities with approximately equal populations is selected for study. The sales of the product in thousand Rs and the level of radio advertising expenditure in thousand Rs are recorded for each of the 22 cities (n) and sum, sum of square, and sum of cross product of X and Y are summarized below.

$\sum Y = 26953$, $\sum X = 950$, $\sum Y^2 = 35528893$, $\sum X^2 = 49250$, & $\sum YX = 1263940$

(a) Fit a simple linear regression model of Y and X using the least square method. Interpret the estimated slope coefficient.

(b) Compute $R^2$ and interpret it.

## Group B

Answer any eight questions: (8×5=40)

4. Describe the scopes and limitations of statistics in empirical research.
5. Write down the properties and importance of density function of a continuous random variable. Suppose a continuous random variable X has the density function.

$$f(x) = \begin{cases} k(1-x)^2 \, if \, 0 < x < 1 \\ 0 \quad eleswhere \end{cases}$$

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

6. Suppose that X and Y have joint density function.

$$f(x, y) = \begin{cases} (x+y) \;\; if \, 0 < x, y < 1 \\ 0 \quad otherwhere \end{cases}$$

Find (a) marginal density function of X and Y and (b) covariance between X and Y.

7. In a Poisson distribution with parameter $\lambda$ derive the mean and variance of the distribution.

8. The length of life of automatic washer (X) is approximately normally distributed with mean and standard deviation equal to 3.1 and 1.2 years, respectively. Compute the probabilities.

   (a) $P(X>1)$, (b) $P(X>2.5)$ and (c) $P(1<X<2)$.

9. If $X_1$, $X_2$, ….. $X_n$ are n independent random variables each is distributed as normal with mean $\mu$ and variance $\sigma2$, then derive the distribution of $\overline{X} = \frac{1}{n}\sum_{i=1}^{n} X_1$

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

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

   For h>0, prove that $P(X>t+h \mid X>t)=P(X>h)$, and hence prove that

   $P(X>t+h)=P(X>t)\times P(X>h)$.

11. If $X_{1,}X_2$, ……, $X_n$ are n independent Bernoulli random variables with common mean p, derive the maximum likelihood estimator of p. Prove or disprove the estimator is unbiased for P?

12. A car manufacturer claims that its care use, on average, no more than 5.5 gallons of petrol for each 100 miles. A consumer groups tests 40 of the cars and finds an average consumption of 5.65 gallons per 100 miles and a standard deviation of 1.52 gallons. Do these results cast doubt on the claim made by the manufacturer? Answer the question by setting appropriate null and alternative hypotheses and testing the null hypothesis at 5% level of signigificance.

13. The average length of time required to complete a certain aptitude test is claimed to be no more than 80 minutes. A sample of 25 students yielded an average of 86.5 minutes and a standard deviation of 15.4 minutes. Do these results cast doubt on the claim? Assuming that test score is normally distributed answer the query by setting appropriate null and alternative hypotheses and testing the null hypothesis at 5% level of significance.

**Tribhuvan University**
**Institute of Science and Technology**
**2068**

Bachelor Level/First Year/First Semester/Science
**Computer Science and Information Technology Stat.108**
**(**Statistics I)

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

Candidates are required to give their answer in their own words as for as practicable.
All notations have the usual meanings.

Group A

Attempt any two: (2×10=20)

**1.** Write the importance of sampling over census. Describe systematic sampling. In a population with N=6 the values of Y are 8, 3, 1, 11, 4 and 7. Calculate the sample Mean $\bar{y}$ for all possible simple random samples without replacement of size 2. Verify that $\bar{y}$ is an unbiased estimate of $\bar{Y}$ .

**2.** The following data represent the operating times in hours for three types of scientific pocket calculators before a recharge is required.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Calculator A | 4.9 | 6.1 | 4.3 | 4.6 | 5.3 | | |
| Calculator B | 5.5 | 5.4 | 6.2 | 5.8 | 5.5 | 5.2 | 4.8 |
| Calculator C | 6.4 | 6.8 | 5.6 | 6.5 | 6.3 | 6.6 | |

Use the Kruskal-Wallis test, at the 0.01 level of significance, to test the hypothesis that the operating times for all three calculators are equal.

**3.** The following table shows the scores (Y) made by ten assembly line employees on a test designed to measure job satisfaction. It also shows the scores made on an aptitude test ($X_1$) and the number of days absent ($X_2$) during the past year (excluding vacations).

| **Y** | **$X_1$** | **$X_2$** |
|---|---|---|
| 70 | 6 | 1 |
| 60 | 6 | 2 |
| 80 | 8 | 1 |
| 50 | 5 | 8 |
| 55 | 6 | 9 |
| 85 | 9 | 0 |
| 75 | 8 | 1 |
| 70 | 6 | 1 |
| 72 | 7 | 1 |
| 64 | 6 | 2 |

The summation values are as following:

$\sum Y = 681$ $\sum X_1 = 67$ $\sum X_2 = 26$ $\sum X_1Y = 4673$ $\sum X_2Y = 1510$

$\sum X_1X_2 = 153$ $\sum Y^2 = 47455$ $\sum X_1^2 = 463$ $\sum X_2^2 = 158$

a. Calculate the least squares equation that best describes these three variables.

b. Predict the value of scores when aptitude test is 7 and number of days absent is 6.

Group B

Answer any eight questions:

(8×5=40)

4. Show that in simple random sampling without replacement sample mean is an unbiased estimate of population mean.
5. What do you mean by partial correlation coefficient? State the relationship between simple and partial correlation coefficients when there are three variables. If $r_{12} = 0.5$, $r_{23} = 0.1$ and $r_{13} = 0.4$, compute $r_{12.3}$ and $r_{23.1}$.
6. Explain two stage sampling with sample mean and corresponding variance.
7. Differentiate parametric and non parametric test.
8. In an industrial production line, items are inspected periodically for defectives. The following is a sequence (from left to right) of defective items, D, and non defective items, N, produced by this production line:

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| D | D | N | N | N | D | N | N | D | D |
| N | N | N | N | N | D | D | D | N | N |
| D | N | N | N | N | D | N | D | | |

Use run test with a significance level 0.05 to determine whether the defectives are occurring at random or not

9. Use the sign test to see whether there is a difference between the number of days required days required to collect an account receivable before and after a new collection policy. Use the 0.05 significance level.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Before | 33 | 36 | 41 | 32 | 39 | 47 | 34 | 29 | 32 |
| After | 35 | 29 | 38 | 34 | 37 | 47 | 36 | 32 | 30 |

10. A random sample of 200 married men, all retired, were classified according to education and number of children.

| **Education** | **Number of children** | | |
|---|---|---|---|
| | **0-1** | **2-3** | **Over 3** |
| Elementary | 14 | 37 | 32 |
| Secondary | 19 | 42 | 17 |
| College | 12 | 17 | 10 |

Test the hypothesis, at the 0.05 level of significance, that the number of children is independent of the level of education attained by the father.

11. Write Cobb-Douglas production function with interpretation of the regression coefficients.
12. Suppose the residuals for a set of data collected over 8 consecutive time periods are as follows:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Time Period: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Residuals: | - 4 | - 3 | - 3 | - 2 | 1 | 1 | 3 | 7 |

Compute the first order autocorrelation.

13. Explain the term multicollinearity and describe a situation where the problem of multicollinearity arises?