

Tribhuvan University
Institute of Science and Technology
2070
☆

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 answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Attempt all questions.

Group A

(10x2=20)

- ✓ 1. Define odd and even function, with examples.
- ✓ 2. Show that the series $\sum_{n=1}^{\infty} \frac{(-1)^n 5}{4^n} = \frac{-5}{4} + \frac{5}{16} - \frac{5}{64} + \dots$ converges to -1.
- ✓ 3. Test the convergence of the series $\frac{(2n)!}{n!n!}$.
4. Find the eccentricity of the curve $2x^2 + y^2 = 4$.
5. Find the angle between the planes;
 $3x - 6y - 2z = 15$, and $2x + y - 2z = 5$
6. Find the velocity and acceleration of a particle whose position is
 $\vec{r}(t) = (t+1)\vec{i} + (t^2-1)\vec{j}$, at $t = 1$.
7. Evaluate $\int_0^{2\pi} \int_0^{\pi} (\sin x + \cos y) dx dy$.
8. Find the Jacobian $J(u, v, w)$ if $x = u + v$, $y = 2u$, $z = 3w$.
9. Show that $y = x^2 + 5$ is the solution of $\frac{dy}{dx} = 2x$.
10. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ at $(1, 2)$ of $f(x, y) = x^2 + 2xy + 5$.

Group B

(5x4=20)

11. State Rolle's theorem and verify it for the function $f(x) = \sin x$ in $[0, \pi]$.
12. Find the Taylor series and the Taylor polynomials generated by $f(x) = e^x$ at $x = 0$.

13. Find the length of the cardioid $r = 1 + \cos \theta$.

14. Define gradient vector of $f(x, y)$ at a point $P(x_0, y_0)$. Find an equation for the tangent to the ellipse $x^2 + 4y^2 = 8$ at the point $(-2, 1)$.

15. Find the general solution of

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

Group C

(5x8=40)

16. Find the area of the region bounded by $x = 2y^2$, $x = 0$ and $y = 3$.

OR

Investigate the convergence of the integrals

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

17. Find the torsion, normal and curvature for the space curve
 $\vec{r}(t) = (2 \cos t)\vec{i} + (3 \sin t)\vec{j} + t\vec{k}$.

18. Evaluate $\int_1^4 \int_0^{\sqrt{1-x^2}} dy \, dx$.

19. Find the local maximum, minimum and saddle point of $6x^2 - 2x^3 + 3y^2 + 6xy$.

OR

Find the greatest and smallest values that the function $f(x, y) = xy$ takes on the ellipse

$$\frac{x^2}{8} + \frac{y^2}{2} = 1.$$

20. Define the wave equation by the modeling of vibrating string.

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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 answers in their own words as far as practicable.
The figures in the margin indicate full marks.*

Attempt all questions.

1. What is logical error? Write flowchart and program for checking whether the number entered by the user is exactly divisible by 5 but not by 11. (1+5)

OR

What is an algorithm? Write an algorithm to check given number is prime or composite. (1+5)

2. What is operator? List any six operators used in C-programming language. Write a program to find least number between any two number using ternary operator. (1+2+3)

3. Define printf() function, header file and main() function. Find the value of following expressions. Use the value initially assigned to the variables for each expressions. (4.5+1.5)

int a = 8, b = 5;

float x = 0.005, y = -0.01;

i) $2 * ((a/5) + (4 * (b - 3)) \% (a + b - 2));$

ii) $(x > y) \&\& (a > 0) \&\& (b < 5);$

iii) $(a > b) ? a : b;$

4. Differentiate between if and switch statement. Write a program to read the marks of four subjects then find total, percentage and division according to given condition. (1+5)

Percentage

P ≥ 80

80 > P ≥ 70

70 > P ≥ 50

50 > P ≥ 40

Otherwise

Division

Distinction

First division

Second division

Third division

Fail.

Assume each subject carrying 100 full marks and student must secure greater or equal to 40 in each subject for division.

5. Differentiate between break and continue statement. Write a program to display following output. (2+4)

```
1
1 1
1 1 1
1 1 1 1
1 1 1 1 1
```

- ✓ 6. Write a program to input any 10 numbers then find out greatest and smallest number. (6)
7. Write a program to add two 3×3 matrix using function. (6)
8. What is recursion? Write a program to find the factorial of given number using recursion. (2+4)

OR

What is pointer? Write a program to sort 'n' numbers in ascending order using dynamic memory. (2+4)

9. List any five names of graphics function. Write a program to read lines of text then count no. of vowels. no. of digits and no. of spaces. (2+4)
10. Write a program to create a file "RECORD.IXT" then store roll no, name and percentage of 10 students. (6)

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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 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 computer and compare each of them.
2. Explain with steps how the CPU and memory work.
- ③ 3. Define network topology. What are the different types of network topologies? Explain.

Short Questions:

Attempt any eight questions:

(8×5=40)

- ✓ 4. What are the major components of a computer? Explain.
5. What are supercomputers? Explain its applications.
- ⑥ 6. What is the function of the memory?
7. What is an auxiliary storage device?
8. Differentiate between multitasking and multiprocessing.
- ✓ 9. Explain the network protocols.
10. What are the disadvantages of distributed data processing?
- ✓ 11. What is FTP and how does it work?
- ✓ 12. How does e-mail work?
- ✓ 13. Explain the IT in the medical sector.

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(Introduction to Information Technology)

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

*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. Compare the first electronic computer and its features with first commercial computer and its features.
2. What is a database management system? Explain different levels of database services. Describe meaning, use and purpose of each level.
3. Explain the relationship between intranets, extranets and e-commerce. What is business to customer e-commerce and its benefits?

Short Questions:

Attempt any eight questions:

(8×5=40)

- ✓ 1. How is a PC different from a workstation?
- ✓ 2. What are the major auxiliary storage devices for a computer?
- ✓ 3. What are the differences between third and fourth generation languages?
- ✓ 4. What are the different normal forms in database design?
- ✓ 5. Describe the different types of computer networks in brief.
6. What is HTML and what is its importance?
- ✓ 7. What is the difference between data mining and other data verification technologies?
8. What is CAI and what are its advantages?
9. Explain office automation and its technologies.
10. Write short notes on (any two):
 - a) spamming
 - b) ISDN
 - c) Assembly languages.

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Bachelor Level / First Year/ First Semester/ Science
Computer Science and Information Technology Stat. 103
(Probability and Statistics)

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

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

Group A

Attempt any Two:

(2×10=20)

1. Explain with suitable examples the term 'dispersion'. State the relative and absolute measures of 'dispersion'. Describe merits and demerits of standard deviation. A merital arithmetic test for 8 questions given to a class of 32 pupils. The result were summarized in the following table.

Number of correct answers: 0 1 2 3 4 5 6 7 8

Number of pupils: 1 1 2 4 4 8 5 4 3

Find the mean, median and mode of the number of correct answers. Describe the shape of the distribution.

- ✓2. Define independent and mutually exclusive events. Can two events be mutually exclusive and independent simultaneously? Support your answer with an example.

A factory has three machines A, B, C producing large numbers of a certain item of the total daily production of the items 50% are produced on A, 30% on B and 20% on C. Record show that 2% of the items produced on A are defective, 3% of items produced on B are defective and 4% of items produced on C are defective. The occurrence of a defective item is independent of all other items.

One item is chosen at random from a day's total output.

- (a) Show that the probability of it being defective item is 0.027.
(b) Given that it is defective, find the probability that it was produced on machine A.

- ✓3. Distinguish between correlation and Regression. Also point out the properties of regression coefficients. The following sample observations were randomly selected.

X 5 3 6 3 4 4 6 8

Y 13 15 7 12 13 11 9 5

Determine the coefficient of correlation and coefficient of determination. Interpret the association between X and Y. Find the regression equation of Y on X.

Group B

Answer any eight questions:

(8×5=40)

4. The continuous random variable X has the probability density function given by

$$f(x) = \begin{cases} k(1+x^2) & \text{for } -1 \leq x \leq 1 \\ 0 & \text{elsewhere} \end{cases}$$

Where K is constant.

- (a) Find the value of K (b) Find $P(0.3 \leq x \leq 0.6)$

5. The marks of 500 candidates in an examination are normally distributed with a mean of 45 marks and standard deviation of 20 marks.

(a) Give the pass marks is 40, estimate the number of candidates who passed the examination.

(b) If 5% of the candidate obtain a distinction by scoring x marks or more, estimate the value of x.

6. The joint density function of w and z is given by

$$f(w, z) = \begin{cases} bwz, 1 \leq w \leq 3, 2 \leq z \leq 4 \\ 0 & \text{otherwise} \end{cases}$$

Find b and marginal density function. w, z

7. Mr X recorded number of e-mails be received over a period of 150 days with the following results.

Number of e-mails: 0 1 2 3 4

Number of days : 51 54 36 6 3

(a) Find the mean number of e-mails per day.

(b) Calculate the frequencies of the poisson distribution having the same mean.

8. Distinguish between the point estimation and interval estimation. Explain how an interval estimation is better than a point estimate.

9. Explain the concept of standard error. Discuss the role of standard error in large sample theory.

10. The random variable X has the probability distribution shown below

x :	0	1	2
P(X = x) :	0.2	0.3	0.5

(a) Find E(x) and V(x)

(b) Calculate E(Y) if $Y = 3X + 2$.

11. The mean life of a sample of 400 fluorescent light bulbs produced by a company is found to be 1570 hours with standard deviation of 150 hours. Test the hypothesis that the mean life time of the bulbs produced by the company is 1600 hrs against the alternative hypothesis that it is greater than 1600 hours of 5% level of significance.
12. Define binomial distribution. Is there any inconsistency in the statement that the mean of binomial distribution is 20 and standard deviation is 4. If no inconsistency is found what are the values of p, q and n.
13. Find the skewness of the following set of data pertaining to kilowatt hours of electricity consumed by 100 persons in a city.

Consumption (in Kwh) :	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of cyers:	10	20	40	20	10

Also interpret the result.

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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 answers in their own words as far as practicable.
All notations have the usual meanings.*

Group A

Attempt any Two:

(2×10=20)

1. A population consists of five numbers 1, 2, 3, 4 and 5.
 - (a) Write down all possible samples of size two without replacement.
 - (b) Find the mean and variance of the population.
 - (c) Verify that mean of sample mean is equal to the population mean.
 - (d) Calculate the standard error of sampling distribution of the sample mean.
 - (e) Also verify with the formula

$$S.E(\bar{X}) = \sigma / \sqrt{n} \sqrt{\frac{N - \bar{x}}{N - 1}}$$

2. Suppose you are given following information with $n = 5$.
 Multiple regression model $\hat{Y} = 7.34 + 0.07 X_1 - 0.58 X_2$
 Total variation = $\sum (Y - \bar{Y})^2 = 20$
 Explained variation = $\sum (\hat{Y} - \bar{Y})^2 = 2.46$.

- (i) Estimate the value of Y when $X_1 = 50$ and $X_2 = 4$
- (ii) Calculate the standard error of estimate.
- (iii) Calculate the coefficient of multiple determination.
- (iv) Test the significance of regression coefficients of the regression model.

3. A teacher wishes to test three different teaching methods: I, II and III. To do this, the teacher chooses at random three groups of five students each and teachers each groups by different methods. The same examination is given to all the students and grades in a table are obtained. Set up null and alternative hypothesis and carry out Kuskall-walis test at 5% level of significance to determine whether there is a difference between the teaching methods.

Method I	: 78	62	71	58	73
Method II	: 76	85	77	90	87
Method III	: 74	78	60	75	80

Group B

Answer any eight questions:

(8×5=40)

4. Distinguish between complete enumeration and sampling study. In what situations sampling is inevitable?

5. What do you mean by stratified random sampling? Discuss proportional allocation in stratified sampling.
6. Distinguish between parametric and non parametric test. Give advantage and disadvantage of non-parametric test.
7. Tossing a coin 25 times, the following sequence of heads "H" and tails "T" was obtained
 TTHT HHTTHTT HTT HTT HHTT HHT HHHT
 use a run test to test whether the coin is unbiased on which produced a random sequence (distribution of H and T).
8. The numbers of sports team are interested in whether the weather has an effect on their results. They play 50 matches, with the following results.

Results	Weather		Total
	Good	Bad	
Win	12	4	16
Draw	5	8	13
Loose	7	14	21
Total	24	26	50

Formulate suitable null and alternative hypothesis and use a χ^2 test to test the claim, at the 1% level of significance, that the weather has no effect on the team's result. State your conclusion clearly.

9. Describe multiple regression model with its assumption. Also describe the method of obtaining its parameter.
10. In a trivariate distribution it is found that $r_{12} = 0.70$, $r_{23} = 0.46$ and $r_{13} = 0.61$. Find the values of r_{123} and R_{123} .
11. The following are the residuals for a set of data calculated over 16 consecutive time periods are as follows:
 Time : 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
 Residuals: ~~8~~ -7 -6 -5 -4 -3 -2 -1 1 2 3 4 5 6 7 8
~~-8~~
- Find first order and second order autocorrelation coefficients.
12. Explain multicollinearity and autocorrelation and their applications in analysis of regression model.
13. Write short notes of any two of the following?
 (a) Heteroscedasticity
 (b) Systematic sampling
 (c) Median test.