

Tribhuvan University
Institute of Science and Technology
2076
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Bachelor Level / First Year / Second Semester / Science
Computer Science and Information Technology (CSc 162)
(Microprocessor)
(NEW COURSE)

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.

Group A

Long answer questions:

Attempt any Two questions:

(2x10=20)

1. Draw block diagram of 80386 and explain its functional units.
2. Describe the working mechanism of DMA. Draw the internal architecture of the 8237 DMAC along with a timing diagram illustrating the process of DMA transfers.
3. Write an assembly language program to find the greatest number in an array in using 8 bit microprocessor. (Assume appropriate array data and address where minimum array size of 20 should be considered.)

Group B

Short answer questions:

Attempt any Eight questions:

(8x5=40)

4. Explain the addressing modes of 8086 microprocessor with examples.
5. Write an ALP for 8086 to read a string and print it in the reverse order.
6. Differentiate between PUSH and POP instruction with example illustrating the use of these instructions.
7. Write the process of address and data separation in De-multiplexed address/data bus in 8085 microprocessor.
8. What is CALL operation? How does it differ with JUMP operation?
9. Differentiate between synchronous and asynchronous serial communication. Show DTE-DTE and DTE-DCE connection according to RS-232 serial communication standard.
10. What is flag? Explain the flags that are present in 8085 microprocessor.
11. What is instruction set? Explain various kinds of instructions of 8086 microprocessor.
12. Write short notes on:
 - a) Harvard architecture
 - b) GDT and LDT

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Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (STA. 164)
(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.

The figures in the margin indicate full marks.

Group A

Long answer questions:

Attempt any Two questions:

(2x10=20)

1. What are the roles of measure of dispersion in descriptive statistics? Following table gives the frequency distribution of thickness of computer chips (in nanometer) manufactured by two companies.

Thickness of computer chips		5	10	15	20	25	30
Number of chips by	Company A	10	15	24	20	18	13
	Company B	12	18	20	22	24	4

Which company may be considered more consistent in terms of thickness of computer chips? Apply appropriate descriptive statistics.

2. A study was done to study the effect of ambient temperature on the electric power consumed by a chemical plant. Following table gives the data which were collected from an experimental pilot plant.

Temperature(⁰ F)	27	45	72	58	31	60	34	74
Electric power (BTU)	250	285	320	295	265	298	267	321

- Identify which one is response variable, and fit a simple regression line, assuming that the relationship between them is linear.
- Interpret the regression coefficient with reference to your problem.
- Obtain coefficient of determination, and interpret this.
- Based on the fitted model in (a), predict the power consumption for an ambient temperature of 65⁰F.

3. (a) Define Normal distribution. What are the main characteristic of a Normal distribution?
(b) What do you mean by probability density function? Write down its properties.

Group B

Short answer questions:

Attempt any Eight questions:

(8x5=40)

4. The following table gives the installation time (in minutes) for hardware on 50 different computers.

Installation time	0-10	10-20	20-30	30-40	40-50	Total
Number of computers	4	-	10	-	10	50

If the average installation time is 30.2 minutes, find missing frequencies.

5. The length of power failure in minute are recorded in the following table.

Power failure time	22	23	24	25	26	27	28	Total
frequency	2	5	7	10	4	3	2	33

Find Q_3 , D_2 and P_{40} and interpret the results.

6. A manufacturing company employs three analytical plans for the design and development of a particular product. For cost reasons, all three are used at varying times. In facts, plan 1, 2 and 3 are used for 30%, 20% and 50% of the products respectively. The defect rate in different procedures is as follows: $P(D/P_1) = 0.01$, $P(D/P_2) = 0.03$, $P(D/P_3) = 0.02$, where $P(D/P_j)$ is the probability of a defective product, given plan j . If a random product was observed and found to be defective, which plan was most likely used and thus responsible?

7. The random variable X has following probability distribution.

X	0	1	2	3	4	5	6
$P(X=x)$	0.03	0.15	0.4	0.2	0.1	.07	.05

Find (i) $E(X)$ and $\text{var}(X)$ (ii) Calculate $E(Y)$ if $Y = 3X + 5$.

8. If two random variables have the joint probability density function

$$f(x, y) = \begin{cases} k(2x + 3y), & \text{for } 0 \leq x \leq 1, 0 \leq y \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

Find (i) constant k (ii) Conditional probability density function of X given Y (iii) Identify whether X and Y are independent.

9. A large chain retailer purchases a certain kind of electronic device from a manufacturer. The manufacturer indicates that the defective rate of the device is 15%. The inspector randomly picks 10 items from a shipment. What is the probability that there will be at least one defective item among these 10?

10. Messages arrive at an electronic message center at random times, with an average of 9 messages per hour.

- What is the probability of receiving at least four messages during the next hour?
- What is the probability of receiving at most three messages during the next hour?

11. Following data represent the preference of 10 students studying B.Sc.(CSIT) towards two brands of computers namely DELL and HP.

Computer	Student preference									
Lenovo	5	2	9	8	1	10	3	4	6	7
Acer	10	5	1	3	8	6	2	7	9	4

Apply appropriate statistical tool to measure whether the brand preference is correlated. Also interpret your result.

$$P(x) = \frac{e^{-\lambda} \lambda^x}{x!}$$

12. What do you mean by measurement scale? Describe the different types of measurement scales used in statistics.

13. What is sampling? Discuss various probability sampling techniques with merits and demerits.

mean = $\bar{X} - \sigma$
 sample statistic
 obtained from sample
 population parameter
 obtained from popⁿ

$$m_1 x_1 = a \pmod{m_1}$$

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Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (CSc.160)
(Discrete Structure)
(NEW COURSE)

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.

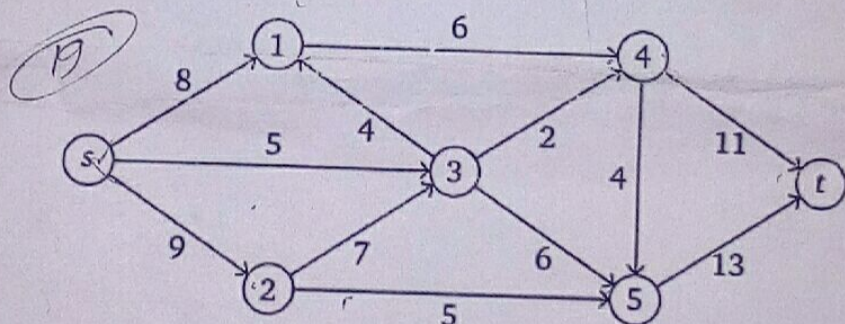
Group A

Long answer questions:

Attempt any Two questions:

(2x10=20)

1. State pigeonhole principle. Solve the recurrence relation $a_n = 3a_{n-1} - 3a_{n-2} + a_{n-3}$ with initial conditions $a_0 = 1, a_1 = 3, a_2 = 7$. (2 + 8)
2. Find the value of x such that $x \equiv 1 \pmod{3}$, $x \equiv 1 \pmod{4}$, $x \equiv 1 \pmod{5}$ and $x \equiv 0 \pmod{7}$ using Chinese remainder theorem. (10)
3. Define Euler circuit with suitable example. Find the maximal flow from s to t from the given network flow. (2 + 8)



Group B

Short answer questions:

Attempt any Eight questions:

(8x5=40)

4. Prove that for every positive integer $n \geq 1$, $n^2 + n$ is even integer using mathematical induction. (5)
5. All over smart people are stupid. Children of stupid people are naughty. John is children of Jane. Jane is over smart. Represent these statements in FOPL and prove that John is naughty. (5)
6. Which of the following are posets? (5)
 - a. $(\mathbb{Z}, =)$
 - b. (\mathbb{Z}, \neq)
 - c. (\mathbb{Z}, \subseteq)

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7. Define reflexive closure and symmetric closure. Find the remainder when $4x^2 - x + 3$ is divided by $x + 2$ using remainder theorem. (3 + 2)
8. Define Euler path and Hamilton path. Give examples of both Euler and Hamilton path. (2+3)
9. How many 3 digits numbers can be formed from the digits 1,2,3,4 and 5 assuming that: (5)
 - a. Repetitions of digits are allowed
 - b. Repetitions of digits are not allowed
10. What is minimum spanning tree? Explain Kruskal's algorithm for finding minimum spanning tree. (1.5+3.5)
11. List any two applications of graph coloring theorem. Prove that "A tree with n vertices has $n-1$ edges". (2 + 3)
12. Define ceiling and floor function. Why do we need Inclusion – Exclusion Principle? Make it clear with suitable example. (2 + 3)

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Bachelor Level / First Year/ Second Semester/ Science
Computer Science and Information Technology (CSc.161)
(Object Oriented Programming)
(NEW COURSE)

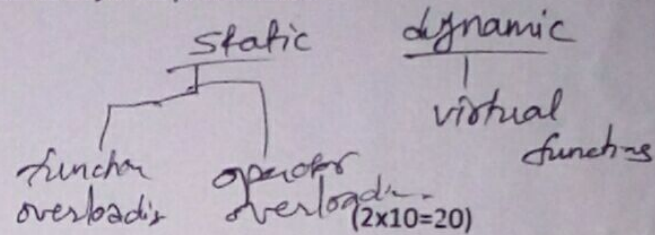
Full Marks: 60
Pass Marks: 24
Time: 3 hours.

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Long answer questions:

Group A

Attempt any Two questions:



1. Write a program according to the specification given below:
 - Create a class Teacher with data member sid & subject and member functions for reading and displaying data members.
 - Create another class Staff with data members sid & position, and member functions for reading and displaying data members.
 - Derive a class Coordinator from Teacher and Staff and the class must have its own data member department and member functions for reading and displaying data members.
 - Create two object of Coordinator class and read and display their details.

2. Explain the concept of operator overloading? List the operators that cannot be overloaded. Write programs to add two object of distance class with data members feet and inch by using member function and friend function.

3. Explain types of polymorphism briefly. Write down roles of polymorphism. How can we achieve dynamic polymorphism briefly. Write down roles of polymorphism. How can we achieve dynamic polymorphism? Explain with example.

Group B

Short answer questions:

Attempt any Eight questions:

(8x5=40)

4. How object oriented programming differs from object based programming language? Discuss benefits of OOP.

5. What is the use of new and delete operators? Illustrate with example. What are advantages of new over malloc.

6. What is meant by return by reference? How can we return values by reference by using reference variable? Illustrate with examples.

- ✓ 7. What is destructor? Write a program to show the destructor call such that it prints the message "memory is released". (3)
- ✓ 8. What is this pointer? How can we use it for name conflict resolution? Illustrate with example. (3)
- ✓ 9. How can you define catch statement that can catch any type of exception? Illustrate the use of multiple catch statement with example. (4)
- ✓ 10. What is meant by template? How can you define function template to return maximum of two integers, floats, or characters? Explain with example. (1)
11. Which functions can be used for reading and writing object? Define briefly. Write a program that reads values of two objects of student class (assume data members are sid, sname, and level) and display the data in monitor. (4)
- ✓ 12. Write short notes on:
 - Cascading of IO operators ✓
 - Pure Virtual Function

(2)

class <Template T> {

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Bachelor Level / First Year / Second Semester / Science
Computer Science and Information Technology (MTH. 163)
(Mathematics II)
(NEW COURSE)

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.

Group- A

3×10=30

Attempt any **THREE** questions.

1. When a system of linear equation is consistent and inconsistent? Give an example for each. Test the consistency and solve the system of equations: $x-2y=5$, $-x+y+5z=2$, $y+z=0$. [2+2+6]
2. What is the condition of a matrix to have an inverse? Find the inverse of the matrix

$$A = \begin{bmatrix} 5 & 1 & 2 \\ 1 & 0 & 3 \\ 4 & -3 & 8 \end{bmatrix}, \text{ if it exists.}$$

[2+8]

3. Find the least-square solution of $Ax=b$ for $A = \begin{bmatrix} 1 & -6 \\ 1 & -2 \\ 1 & 1 \\ 1 & 7 \end{bmatrix}$ and $b = \begin{bmatrix} -1 \\ 2 \\ 1 \\ 6 \end{bmatrix}$. [10]

4. Let T is a linear transformation. Find the standard matrix of T such that
- (i) $T: \mathbb{R}^2 \rightarrow \mathbb{R}^4$ by $T(e_1) = (3, 1, 3, 1)$ and $T(e_2) = (-5, 2, 0, 0)$ where $e_1 = (1, 0)$ and $e_2 = (0, 1)$;
- (ii) $T: \mathbb{R}^2 \rightarrow \mathbb{R}^4$ rotates point as the origin through $\frac{3\pi}{2}$ radians counter clockwise.
- (iii) $T: \mathbb{R}^2 \rightarrow \mathbb{R}^4$ is a vertical shear transformation that maps e_1 into $e_1 - 2e_2$ but leaves vector e_2 unchanged.

[4+3+3]

Group- B

10×5=50

Attempt any **TEN** questions.

5. For what value of h will y be in span $\{v_1, v_2, v_3\}$ if $v_1 = \begin{bmatrix} 1 \\ -1 \\ -2 \end{bmatrix}$, $v_2 = \begin{bmatrix} 5 \\ -4 \\ -7 \end{bmatrix}$, $v_3 = \begin{bmatrix} -3 \\ 1 \\ 0 \end{bmatrix}$ and $y = \begin{bmatrix} -4 \\ 3 \\ h \end{bmatrix}$? [5]

6. Let us define a linear transformation $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ by $T(x) = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} -x_2 \\ x_1 \end{bmatrix}$. Find the image under T of $u = \begin{bmatrix} 4 \\ 1 \end{bmatrix}$, $v = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$, and $u+v = \begin{bmatrix} 6 \\ 4 \end{bmatrix}$. [5]

$$T = \sqrt{-}$$

$$a * (b * c) = (a * b) * c$$

$$-1 - \frac{1}{2} \times (2) = -2$$

$$7 - \frac{1}{2} \times 8 = 3$$

$$0 - \frac{1}{2} \times (-9) = \frac{9}{2}$$

$$2 + \frac{1}{2} \times (-9) = -\frac{5}{2}$$

$$2 - \frac{3}{2} = \frac{1}{2}$$

$$= \frac{1}{2}$$

$$= -\frac{5}{2}$$

7. Let $A = \begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -5 \\ 3 & k \end{bmatrix}$. Determine the value(s) of k if any will make $AB = BA$. [5]

8. Define determinant. Compute the determinant without expanding $\begin{vmatrix} -2 & 8 & -9 \\ -1 & 7 & 0 \\ 1 & -4 & 2 \end{vmatrix}$. [1+4]

9. Define null space. Find the basis for the null space of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \end{bmatrix}$. [1+4]

10. Let $B = \{b_1, b_2\}$ and $C = \{c_1, c_2\}$ be bases for a vector space V , and suppose $b_1 = -c_1 + 4c_2$ and $b_2 = 5c_1 - 3c_2$. Find the change of coordinate matrix for a vector space and find $[x]_C$ for $x = 5b_1 + 3b_2$. [2.5+2.5]

11. Find the eigenvalues of the matrix $\begin{bmatrix} 6 & 5 \\ -8 & -6 \end{bmatrix}$. $\lambda = 2, -2$ [5]

12. Find the QR factorization of the matrix $\begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix}$. [5]

$$A = QR$$

$$R = Q^T A$$

13. Define binary operation. Determine whether the binary operation $*$ is associative or commutative or both where $*$ is defined on \mathbb{Q} by letting $x * y = \frac{x+y}{3}$. [5]

14. Show that the ring $(\mathbb{Z}_4, +, \cdot)$ is an integral domain. [5]

15. Find the vector x determined by the coordinate vector $[x]_\beta = \begin{bmatrix} -4 \\ 8 \\ -7 \end{bmatrix}$ where

$$\beta = \left\{ \begin{bmatrix} -1 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} 3 \\ -5 \\ 2 \end{bmatrix}, \begin{bmatrix} 4 \\ -7 \\ 3 \end{bmatrix} \right\}$$

[5]