INDIAN INSTITUTE OF INFORMATION TECHNOLOGY UNA
HIMACHAL PRADESH
An institute of National Importance under MoE
Saloh, Una - 177 209

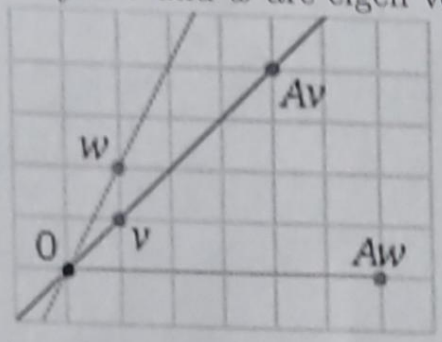
Website: www.iiitu.ac.in

AY 2023-24
School of Computing
Curriculum: IIITUGIT22
Cycle Test - I
October 16, 2023

Degree	B.Tech.
Branch	IT
Semester	I
Subject code/name	MAC131/Engineering Mathematics
Time	60 minutes
Maximum Marks	20

Answer all the questions.

Q.No.	Questions	Marks
1(a)	Compute the rank of the matrix $B = \begin{bmatrix} 1 & 3 & -4 \\ -1 & -3 & 4 \\ 2 & 6 & -8 \end{bmatrix}$.	1
1(b)	Using Gauss-Jordan method, determine the inverse of the matrix $D = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$.	2
1(c)	Determine the values of b for which the matrix equation $AX = b$ has solution, where $A = \begin{bmatrix} 1 & 4 & 5 \\ -3 & -11 & -14 \\ 2 & 8 & 10 \end{bmatrix}$ and $b = \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix}$, $\{b_i, 1 \leq i \leq 3 \in \mathbb{R}\}$.	2
2(a)	Define the terms consistent and inconsistent system of linear equations.	1
2(b)	Examine the system of equations given below for consistency: $x - 2y + 4z = 2$ $2x - 3y + 5z = 3$ $3x - 4y + 6z = 7$	2
2(c)	Obtain the basis and dimension of the solution space W of the following homogeneous system: $x - 2y + 4z = 0$ $2x - 3y + 5z = 0$ $3x - 4y + 6z = 0$	2

3(a)	Consider Figure 1 and justify if v and w are eigen vectors of A?  Figure 1: Vectors v, w, Av, Aw in a two dimensional plane.	1
3(b)	Compute the eigen values of the matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$.	2
3(c)	Find the eigen vectors of A corresponding to eigen values computed in question 3(b). Is the matrix A diagonalisable?	2
4(a)	Consider the matrix $B = \begin{bmatrix} 2 & 2 \\ -4 & 8 \end{bmatrix}$, and vectors $X = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$, $Y = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$. Without using characteristic equation, check if X and Y are eigen vectors of B? If so, what is/are the eigen value(s)?	1
4(b)	Reduce the matrix $D = \begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$ to normal form.	2
4(c)	Using Cayley-Hamilton theorem, compute A^8, A^{10} if $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$.	2

******* All the best*******

Indian Institute of Information Technology Una Himachal Pradesh

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AY 2023-24
School of Basic Sciences
CURRICULUM: IIITUGIT22
Cycle Test – I
16, Oct.' 2023

Degree	B. Tech.	**Branch**	Information Technology
Semester	First		
Subject Code & Name	PHC132: Engineering Physics		
Time: 60 Minutes	**Answer All Questions**	**Maximum: 20 Marks**	

Sl. No.	Question	Marks
1.a	What is the relation between the Lagrangian and the Hamiltonian of a system ?	1
1.b	Make use of Lagrange's formulation, and find the equations of motion of the double pendulum connected in series.	2
1.c	For a given Lagrangian: $$L = \frac{1}{2}m_1\dot{x}_1^2 + \frac{1}{2}m_2\dot{x}_2^2 - \frac{1}{2}k(x_1 - x_2)^2;$$ Find the Hamiltonian of a system.	2
2.a	What is the difference between the inertial and non-inertial frames ?	1
2.b	Make use of Galilean transformation, and show that the acceleration is independent of frame of references.	2
2.c	A person in a train moving at a speed of 10^6 m/s sleeps at 10:00 p.m. by own watch and gets up at 5:00 a.m. How long could person sleep depending on the clocks at the stations ?	2
3.a	What are the learnings from the failure of Michelson-Morley experiment ?	1
3.b	Make use of Lorentz transformation of velocities, and show that a photon moving at c, the speed of light will have the same speed in all frames of reference.	2

Sl. No.	Question	Marks
3.c	Make use of photoelectric effect, and discuss how the photocurrent is depending on: i) The variation of the intensity of light, when the frequency is fixed. ii) The variation of the frequency, when the intensity of light is fixed.	2
4.a	Why the photoelectric effect is the most celebrated phenomenon rather than the thermionic emission of electrons ?	1
4.b	The wavelength of the photoelectric threshold for silver is 3.25×10^{-7} m. Determine the velocity of electron ejected from a silver surface by ultraviolet light of wavelength 2.54×10^{-7} m.	2
4.c	Make use of Compton effect, and calculate the energy loss of a photon in the two successive scattering through 90° each, while the target is an electron.	2

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School of Basic Sciences
CURRICULUM: IIITUGIT22
Cycle Test – I
17, Oct.'23

Degree	B. Tech.	Branch	IT
Semester	I		
Subject Code & Name	BIC103: Introduction to Biotechnology		
Time: 60 Minutes	Answer All Questions		Maximum: 20 Marks

S. No.	Question	Marks
1.a	What is the magnification power of the light microscope employed for visualizing the plant cell with the following parameters: an eyepiece of 10 X and an objective lens of 40 X?	(1)
1.b	Bioengineering of cells is done with the addition/removal of some of the selected cellular components. Interpret the result outcome of the engineered cells: (i) Addition of mitochondria, ribosomes (ii) removal of peroxisomes, lysosomes.	(1+1=2)
1.c	(i) Calculate the percentage of guanine concentration if the total percentage of adenine and thymine concentration present in a given organism is 40%.	(1+1=2)
	(ii) Determine the amino acid sequence of the polypeptide encoded by the mRNA sequence as follows: 5'-AUGGUGGCCUAUCAUUAGCUU-3'	
2.a	Determine the polarity and complementary DNA sequence pattern to the given DNA sequence as follows: 5'-AGCCCCGACTCTATTC-3'.	(1)
2.b	Design the set-up of a medium size biotechnology Industry with a proper layout.	(2)
2.c	Illustrate how DNA is proved experimentally the genetic material of life?	(2)
3.a	Calculate the haploid chromosome number of papaya plants when the total number of chromosomes are 18.	(1)
3.b	(i) Find the mRNA sequence if the coding strand of DNA is as follows: 5'-AATTCAAATTAGG-3'.	(1+1=2)
	(ii) Determine the pattern of mRNA sequence if the template strand of DNA is as follows: 5'-ATGCGATGCTGACAG-3'	
3.c	Demonstrate the role of three types of RNA interplay in controlling the process of translation.	(2)
4.a	How is the screening of recombinant DNA done from the non-recombinant DNA?	(1)
4.b	Illustrate the process of cDNA library construction with utility in genetic engineering.	(2)
4.c	Demonstrate the working principle of PCR with a suitable diagram.	(2)

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17, Oct.'23

Degree	B. Tech.	**Branch**	IT
Semester	I		
Subject Code & Name	BIC103: Introduction to Biotechnology		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

S. No.	Question	Marks
1.a	What is the magnification power of the light microscope employed for visualizing the plant cell with the following parameters: an eyepiece of 10 X and an objective lens of 40 X?	(1)
1.b	Bioengineering of cells is done with the addition/removal of some of the selected cellular components. Interpret the result outcome of the engineered cells: (i) Addition of mitochondria, ribosomes (ii) removal of peroxisomes, lysosomes.	(1+1=2)
1.c	(i) Calculate the percentage of guanine concentration if the total percentage of adenine and thymine concentration present in a given organism is 40%. (ii) Determine the amino acid sequence of the polypeptide encoded by the mRNA sequence as follows: 5'-AUGGUGGCCUAUCAUUAGCUU-3'	(1+1=2)
2.a	Determine the polarity and complementary DNA sequence pattern to the given DNA sequence as follows: 5'-AGCCCCGACTCTATTC-3'.	(1)
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2.c	Illustrate how DNA is proved experimentally the genetic material of life?	(2)
3.a	Calculate the haploid chromosome number of papaya plants when the total number of chromosomes are 18.	(1)
3.b	(i) Find the mRNA sequence if the coding strand of DNA is as follows: 5'-AATTCAAATTAGG-3'. (ii) Determine the pattern of mRNA sequence if the template strand of DNA is as follows: 5'-ATGCGATGCTGACAG-3'	(1+1=2)
3.c	Demonstrate the role of three types of RNA interplay in controlling the process of translation.	(2)
4.a	How is the screening of recombinant DNA done from the non-recombinant DNA?	(1)
4.b	Illustrate the process of cDNA library construction with utility in genetic engineering.	(2)
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Degree	B. Tech.	**Branch**	IT
Semester	I		
Subject Code & Name	ITC104 / Basics of Programming in C		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

S. N.	Question	Marks
1.a	What is the difference between a compiler, an interpreter, and an assembler?	(1)
1.b	Explain various data types and operators that are used in C language.	(2)
1.c	Write a C program to design a simple calculator that can perform basic arithmetic operations (+, -, *, /).	(2)
2.a	What are the different types of control statements in C?	(1)
2.b	What is conditional operator? Write a program to find the largest number among three numbers using conditional operator.	(2)
2.c	Using if-else statement, write a C program to find the grade of a student based on the following criteria: Marks >= 90%: A+ Marks >= 80%: A Marks >= 70%: B Marks >= 60%: C Marks >= 50%: D Marks < 50%: F	(2)
3.a	What is the difference between while loop and do-while loop? Explain with example.	(1)
3.b	Write a C program to determine whether a given number is a palindrome.	(2)

3.c	Explain the following: i) C Character Set ii) Keywords iii) Flowchart and Pseudocode iv) Garbage Value	(2)
4.a	How a matrix is represented in C?	(1)
4.b	Write a program in C to print factorial, square root, and cube of a number using switch statement.	(2)
4.c	Define a linear array and explain with a suitable example how array elements are processed in C.	(2)

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18, Oct. '23

Degree	B. Tech.	**Branch**	IT
Semester	I		
Subject Code & Name	ENC135: Communication Skills		
Time: 60 Minutes	**Answer All Questions**		**Maximum: 20 Marks**

S. No.	Question	Marks
1.a	Explain the difference between 'Cohesion' and 'Coherence' with suitable examples. (Word limit: 50-80)	1
1.b	How does planning impact the process of writing? (Word limit: 100-120)	2
1.c	Explain "Intrapersonal Communication". Discuss intrapersonal barriers to effective communication. (Word limit: 100-120)	2
2.a	Listening is a skill. Explain. (Word limit: 50-80)	1
2.b	What is the difference between assumption and perception as barriers in the process of communication? (Word Limit: 100-120)	2
2.c	What are the different stages of writing? Explain with example. (Word Limit: 100-120)	2
3.a	Apply the rules of Present Perfect Tense to the following sentences with the given verbs: 1. Each of them _____ to Niagara Falls. (be) 2. Ira _____ piano every day ____ a week. (practice)	1

3.b	Rewrite the sentences with suitable idioms: 1. I eat pretty much anything, but I _____ at insects. a. Draw the line b. Hit the sack c. Eat like a horse d. Go cold turkey 2. Her letter sounded cheerful enough, but I _____ a certain sadness. a. Wear your heart on your sleeve b. Cut no ice c. Read between the lines d. Rain on someone's parade	2
3.c	Write down one-word substitution for the following words: 1. To compensate a person for loss or damage 2. A portrait of a person with only the outline of the profile 3. Congratulate someone in a formal manner 4. Person who holds scholarship at a university	2
4.a	How does interruption become a barrier to effective listening? Explain with example. (Word Limit: 50-80)	1
4.b	Describe the difference between resume, CV, and biodata. (Word limit: 100-120)	2
4.c	Write down at least two synonyms for the following words: 1. Indurated 2. Veracity 3. Tyro 4. Implore	2