National Institute of Technology Patna

Department of Mathematics

MID-SEM-EXAMINATION: 18th October, 2023.

Course Name: **Linear Algebra** Course Code:MA14102 / MLA1810 1

Program: B.Tech(CSE) Full Marks:30

Duration: 2 Hrs.

ANSWER ALL SIX QUESTIONS

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1. Find the condition on a, b and c so that $v = (a, b, c)$ in $\mathbb{R}^3$ belongs to $W = \text{span}(u_1, u_2, u_3)$ where $u_1 = (1, 2, 0)$, $u_2 = (-1, 1, 2)$ and $u_3 = (3, 0, -4)$. [5M]

2. Let W be the subspace of $\mathbb{R}^4$ spanned by the vectors $u_1 = (1, -2, 5, -3)$, $u_2 = (2, 3, 1, -4)$ and $u_3 = (3, 8, -3, -5)$. Find the basis and dimension of W. [5M]

3. Find the basis and dimension of the null space of the following matrix:

$$A = \begin{bmatrix} 1 & 3 & 1 & -2 & -3 \\ 1 & 4 & 3 & -1 & -4 \\ 2 & 3 & -4 & -7 & -3 \\ 3 & 8 & 1 & -7 & -8 \end{bmatrix}.$$ [5M]

4. Find the rank of the matrix: $A = \begin{bmatrix} 2 & 0 & 4 & 2 \\ 3 & 2 & 6 & 5 \\ 5 & 2 & 10 & 7 \\ 0 & 3 & 2 & 5 \end{bmatrix}$. [5M]

5. Determine the conditions for which the system of equations

$$x + y + z = 1$$
$$x + 2y - z = b$$
$$5x + 7y + az = b^2$$

admits of (i)only one solution (ii) no solution (iii) many solutions [5M]

6. If $P_3(t)$ be a vector space of polynomials of degree ≤ 3. Find the co-ordinates of vector $v = 3t^3 - 4t^2 + 2t - 5$ relative to the basis $S = \{(t-1)^3, (t-1)^2, t-1, 1\}$. [5M]

*****ALL THE BEST*****

National Institute of Technology Patna

Mid Semester Examination Oct. 2023

Time allotted: 2 Hours ***Full Marks: 30***

Subject: Engineering Physics ***Subject code: PH18101/PH17101***

The figures in the margin indicates full marks

Attempt any <u>three</u> questions

All questions carry equal marks

1. (a) Deduce the equation of motion of a damped harmonic oscillator and obtain its solution. Discuss the condition under which the oscillations are underdamped. [4+4]
   (b) Show that the equation y=2sinkt+3coskt represents S.H.M. [2]

2. (a) Why electric field inside a dielectric decreases due to polarisation.
   (b) Establish the relations between three electric vectors and explain the three electric vectors. [4+6]

3. (a) Describe curl of a vector field and its physical significance. [4+4]
   (b) Show that the vector field $\vec{A} = \frac{-2z^2y}{x^3}\hat{\imath} + \frac{z^2}{x^2}\hat{\jmath} + \frac{2yz}{x^2}\hat{k}$ is irrational. [2]

4. Write short notes of any **<u>two</u>** of the following: [5×2]
   a) Resonance and sharpness of resonance, b) Displacement current
   c) Equation of continuity

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
MID SEMESTER EXAMINATION July-Dec 2023

SUBJECT: Introduction to Computing | **DURATION: 2 Hrs.**
SUBJECT CODE: CS18101 / CS19101 | **FULL MARKS: 30**
SECTION: Physics / Chemistry | **SEMESTER: FIRST**

Attempt Any Five questions

		Marks	CO	BL
Q1.	**(a)** What are the different booting operations of the computer system? **(b)** Explain about Ternary and Bitwise Logical operators in C.	[3] [3]	CO1	Understand
Q2.	**(a)**Define the syntax of the for loop in detail. Write a program in C to find the factorial of any number using a for loop. **(b)**Write a program in C to check whether a number entered by the user is prime or not.	[3] [3]	CO2	Understand
Q3.	**(a)** What are the different characteristics and basic operations of computer systems? **(b)** Explain the different generations of computers.	[3] [3]	CO1 & CO2	Understand
Q4.	**(a)**Explain the difference between the Implicit and Explicit type conversion with a suitable example. **(b)**Write a program in C to find whether a character entered by the user is a vowel or not using If-else.	[3] [3]	CO2	Understand
Q5.	**(a)** Write a program in C to implement addition, subtraction, multiplication, and division using switch statements. **(b)** Write a program in C to check whether a number entered by the user is even or not.	[3] [3]	CO2	Understand
Q6.	**(a)** Explain the components of a computer system in brief. Explain RAM and ROM. **(b)** Explain different types of system buses.	[3] [3]	CO1	Understand

NATIONAL INSTITUTE OF TECHNOLOGY PATNA

Department of Humanities and Social Sciences
Ashok Rajpath, Patna-800 005

MID-SEMESTER EXAMINATION OCTOBER 2023

Course Name: Communicative English

Course Code: HS12101 (A)/ HS13101, HS17101 & HS18101

Group: BTech (CE A&B, ME-A, M&C, M&T)
Faculty: Dr Zeeshan Ali

Full Marks: 22.5
Time: 2 Hours

Instructions: **Answer all the questions in your own words.**

1. What do you understand by 'communication flow'? Explain the different types of communication flow with examples. (7.5 marks) CO1

2. What do you understand by the terms 'hearing' & 'listening'? Explain the different barriers to listening with examples. (7.5 marks) CO4

3. Write an paragraph in 300-350 words on any **one** of the following (7.5 marks) CO7

   a. Global Warming: A threat to our planet
   b. Sustainable Construction
   c. Thermodynamics in Everyday Life

[Note: In your answers add examples to explain your points]

$\alpha = \frac{C}{E}$ $\beta = \frac{C}{B}$

NATIONAL INSTITUTE OF TECHNOLOGY PATNA
PATNA BIHAR

MID-TERM EXAMINATION 2023
COURSE: B. TECH BRANCH: EE/PCM SEM 1st

ELEMENT OF ELECTRONICS (EC16102/ EC17101/EC 18101/EC19101)

TIME: TWO HOURS **MAX MARKS: 30**

All the questions are compulsory, attempt all the questions

1. (a) Explain the PIV, Breakdown mechanism, and type of Breakdown in the PN Junction diode. (3 Marks) [CO 1]
   (b) Determine the range of value of V_i that will maintain the Zener diode to ON state (Fig. 1). (3 Marks) [CO 1]

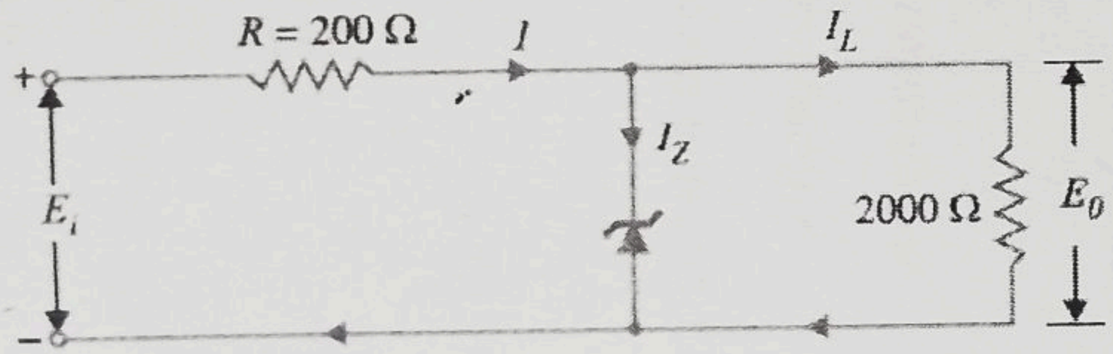


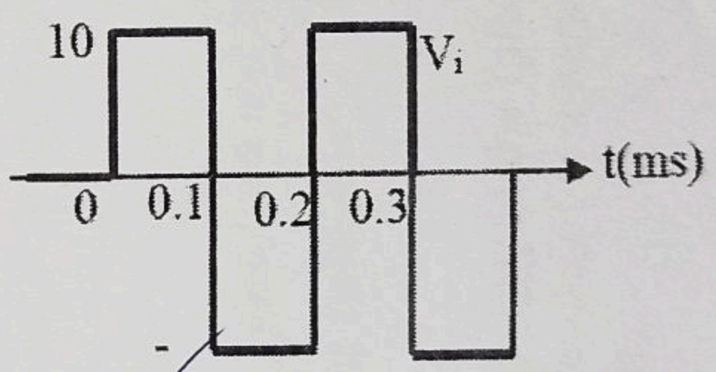
Fig. 1

2. Explain each term for one mark (1 x 6 Mark) [CO 1+ 2]
   (a) Thermal Voltage and give its value at room temperature.
   (b) The emission coefficient of the PN Junction diode (η) and mention its value for silicon and germanium diode.
   (c) Threshold voltage and mention its value for silicon and germanium diode
   (d) Saturation voltage and mention its value for silicon diode.
   (e) Built-in-Potential and write its value for PN Junction diode.
   (f) Static and dynamic resistance of PN Junction diode.

3. (a) Explain the working operation (with a suitable diagram) of centre taped Full wave rectifier (3 Marks) [CO 1]
   (b) Explain the working principle of the Diode logic gate for the AND gate. (3 Marks) [CO 1+4]

4. (a) Explain the working principle of a Bipolar Junction transistor with input, output and transfer characteristics for CE configuration. (4 Marks) [CO 2]
   (b) Write down the relationship between the current gain coefficient of CB, CE and CC Bipolar Junction transistor. If the current gain coefficient of CE is 99 find out the value of the remaining two. (2 marks) [CO 2]

5. (a) Sketch the output waveform for one complete cycle for the given input & circuit in Fig. 2. Assume the diode is an ideal diode. (3 Marks) [CO 1]



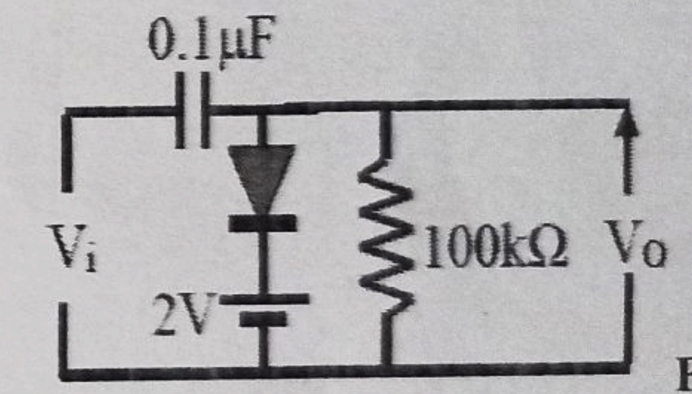
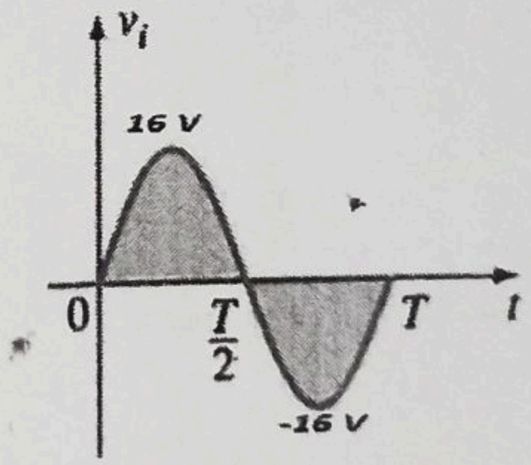


Fig. 2

(b) Find the output and draw the waveform of the circuit shown in Fig 3 for the given sinusoidal input. Assume a diode drop of 0.7 V. (3 Marks) [CO 1]



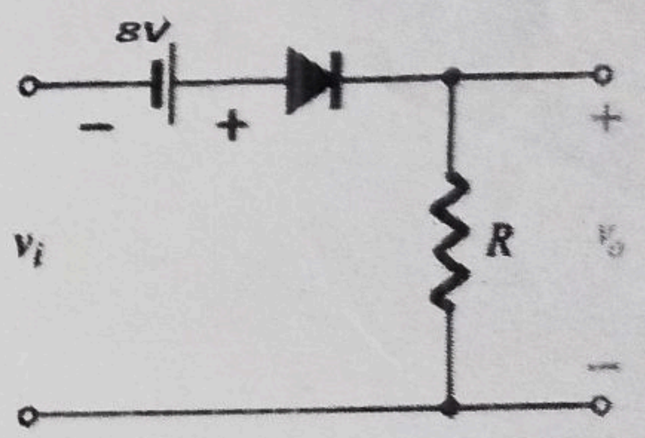


Fig. 3