

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-IMarks CO Blooms
Level

1. Explain various methods for computation of average rainfall over a basin. State the advantages and disadvantages of each method. 10 1 2
- (OR)**
2. a) Draw hydrological cycle and explain the various process involved in hydrological cycle. 5 1 2
- b) What is probable maximum precipitation? Explain different forms of precipitation. 5 1 2

UNIT-II

3. What is infiltration? Explain the different methods of measuring infiltration. 10 2 1
- (OR)**
4. Describe various methods of measuring evaporation from water bodies. 10 2 3

UNIT-III

5. What do you understand by unit hydrograph? How is it derived? 10 3 1
- (OR)**
6. a) What is S-hydrograph? How it is constructed? 5 3 1
- b) The ordinates of a 4 hour unit hydrograph of a catchment area are given below. 5 3 4

Time in hr	0	4	8	12	16	20	24	28	32
UH Ordinate m ³ /s	0	15	30	25	21	17	14	8	0

Find the ordinates of an 8 hour unit hydrograph for the same basin.

UNIT-IV

7. a) Discuss different types of aquifers. Explain the various aquifer parameters. 5 4 2
- b) Explain the following terms: 5 4 2
- (i) Radius of influence (ii) Drawdown
- (iii) Cone of depression (iv) Transmissibility
- (OR)
8. Derive an expression for discharge from a well fully penetrating a confined aquifer. 10 4 4

UNIT-V

9. a) What is water logging? What are its causes and effects? 5 5 1
- b) Explain sprinkler irrigation and drip irrigation methods bringing out suitable cropping pattern. 5 5 2
- (OR)
10. a) Determine the frequency of Irrigation from the following data: 5 5 3
- Field capacity: 27%, Permanent wilting point: 14%, Dry density of soil: 15 kN/m^3 , effective depth of root zone: 75cm, Daily consumptive use of water for the crop: 11mm, Readily available moisture: 80% of available moisture.
- b) Define the term Duty and Delta. Derive a relation between the two. 5 5 3

UNIT-VI

11. Design an irrigation channel section for the following data: discharge=30 cumecs, silt factor =1.0, side slopes =1/2:1, Determine the longitudinal slope also use Lacey's theory. 10 6 5
- (OR)
12. Explain the following cross drainage works with neat diagrams. 10 6 2
- i) Aqueduct ii) Syphon aqueduct
- iii) Super passage iv) Level crossing

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	Explain in detail about phases of the compiler with neat sketch and examples for each phase separately	10	CO1	K2
	(OR)			
2.	Discuss about Input Buffering in lexical analyser with its types	10	CO1	K6
	<u>UNIT-II</u>			
3. a.	Given the grammar: $S \rightarrow AB a$ $A \rightarrow cA \epsilon$ $B \rightarrow dB b$	5	CO2	K4
	(a) Analyze the FIRST sets for all non-terminals: S, A, and B. (b) Analyze the FOLLOW sets for all non-terminals: S, A, and B.			
b.	Determine whether this grammar is ambiguous. If it is, provide an example string that can be derived in multiple ways, showing the different parse trees.	5	CO2	K5
	$S \rightarrow S+S$ $S \rightarrow S*S$ $S \rightarrow a$			
	(OR)			
4.	Construct an LL(1) Parser for a Simple Arithmetic Language	10	CO2	K3
	$E \rightarrow T + E T$ $T \rightarrow F * T F$ $F \rightarrow (E) num$			
	<u>UNIT-III</u>			
5.	Construct an LR(1) Parser for the following language:	10	CO3	K6
	$S \rightarrow aBc bCc aCd bBd$ $B \rightarrow e$ $C \rightarrow e$			
	(OR)			
6.	Construct the SLR parsing table and also parse the input "a*b+a" for the following grammar:	10	CO3	K3
	$E \rightarrow E+T T$ $T \rightarrow TF F$ $F \rightarrow F* a b$			
	<u>UNIT-IV</u>			
7.	Show the Syntax Directed Translation (SDT) action for the Four Function Calculator grammar and draw the parse tree for the given input: 4+5*6-7	10	CO4	K2

(OR)

- | | | | | |
|----|--|----|-----|----|
| 8. | Inspect the S-attributed and L-attributed definitions for the grammar: | 10 | CO4 | K4 |
|----|--|----|-----|----|

$E \rightarrow E+T | T$
 $T \rightarrow T * F | F$
 $F \rightarrow (E) | \text{num}$

UNIT-V

- | | | | | |
|----|--|----|-----|----|
| 9. | Build the three-address code, identify the basic blocks, and draw the control flow graph for the given code segment. | 10 | CO5 | K3 |
|----|--|----|-----|----|

```

fact(x)
{
    int f = 1;
    for (i = 2; i <= x; i++)
        f = f * i;
    return f;
}

```

(OR)

- | | | | | |
|-----|---|----|-----|----|
| 10. | Interpret the no. of basic block and draw the control flow graph for the given three-address code | 10 | CO5 | K2 |
|-----|---|----|-----|----|

3 Address Code:

1. if (A < C) goto (3)
2. goto (15)
3. if (B > D) goto (5)
4. goto (15)
5. if (A = 1) goto (7)
6. goto (10)
7. T1 = c + 1
8. c = T1
9. goto (1)
10. if (A <= D) goto (12)
11. goto (1)
12. T2 = A + B
13. A = T2
14. goto (10)
15.
-

UNIT-VI

- | | | | | |
|-----|---|----|-----|----|
| 11. | Construct the Target Machine code for the following C Program | 10 | CO6 | K6 |
|-----|---|----|-----|----|

```

void main()
{
    int a;
    a = 0;

    while (a < 10) {
        Print(a % 2 == 0);
        a = a + 1;
    }
}

```

(OR)

- | | | | | |
|-----|---|----|-----|----|
| 12. | Explain in detail about storage organization and various storage allocation strategies with neat sketch and example | 10 | CO6 | K5 |
|-----|---|----|-----|----|

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	(a) Derive the wave equation for a TE wave and obtain the field components in a rectangular wave guides?	5	1	2
	(b) A rectangular waveguide has $a=4\text{cms}$, $b=3\text{cms}$ as it's sectional dimensions, find dominant mode characteristics which will propagate at 5000MHz?	5	1	3
	(OR)			
2.	(a) Derive the wave equation for a TM wave and obtain the field components in a Circular wave guides?	5	1	2
	(b) An air filled circular waveguide has a radius of 3cm and is used as a resonator for TE_{01} mode at 10GHz by placing two perfectly conducting plates at it's two ends. Determine the minimum distance between the two end plates.	5	1	3
	<u>UNIT-II</u>			
3.	(a) Explain about H-plane tee with suitable diagram and derive its S-matrix?	5	2	2
	(b) Explain about magic Tee and derive the S-matrix for magic Tee?	5	2	2
	(OR)			
4.	What are the ferrite devices? Discuss in detail about Isolator and circulator with neat diagram?	10	2	2
	<u>UNIT-III</u>			
5.	(a) Explain the bunching process of two cavity klystron with neat sketch?	5	3	4
	(b) Explain velocity modulation in reflex klystron with apple gate diagram?	5	3	4

(OR)

6. A two-cavity amplifier klystron has the following parameters beam voltage $V_0 = 900\text{V}$, beam current $I_0 = 30\text{mA}$, frequency $f = 8\text{GHz}$, gap spacing in either cavity $d = 1\text{mm}$, spacing between centres of cavities $L = 4\text{cm}$, effective shunt impedance $R_{sh} = 40\text{K}\Omega$, determine (i) The electron velocity (ii) The dc electron transit time. (iii) The input voltage for maximum output voltage. (iv) The voltage gain in decibels.

UNIT-IV

7. Discuss in detail about helix travelling wave tube? 10 4 2

(OR)

8. (a) Explain the modes of resonance and PI mode operation? 5 4 2
- (b) An X-band pulsed cylindrical magnetron has $V_0 = 30\text{kV}$, $I_0 = 80\text{A}$, $B_0 = 0.01\text{Wb/sq.m}$, $a = 4\text{cm}$, $b = 8\text{cm}$. Calculate (i) cut-off voltage and (ii) cut-off magnetic flux density. 5 4 3

UNIT-V

9. Explain the operation of RWH-Two valley theory with suitable diagrams? 10 5 2

(OR)

10. Explain the principle of operation and characteristics of IMPATT diode? 10 5 3

UNIT-VI

11. (a) Explain the measurement of microwave power using bolometer technique with neat sketch? 5 6 2
- (b) Describe the various techniques of measuring unknown frequency of a microwave generator? 5 6 2

(OR)

12. (a) Explain the double minimum method of measuring VSWR? 5 6 2
- (b) With the help of necessary experimental setup, describe the measurement of unknown load impedance using slotted line? 5 6 2

Time: 3 Hours**Max Marks: 60**

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

	<u>UNIT-I</u>	Marks	CO	Blooms Level
1.	Draw the architectural block diagram of the 8086 and explain its function.	10	1	3
	(OR)			
2.	Discuss the concept of memory segmentation in the 8086.	10	1	3
	<u>UNIT-II</u>			
3.	Describe the various addressing modes of the 8086 with suitable examples	10	2	3
	(OR)			
4.	Enumerate the string instructions in the 8086 and explain their functions.	10	2	3
	<u>UNIT-III</u>			
5.	Explain the architecture of the 8255 Programmable Peripheral Interface and its various modes of operation	10	3	2
	(OR)			
6.	Explain how the 8257 can be interfaced with the 8086 microprocessor.	10	3	2
	<u>UNIT-IV</u>			
7.	Describe the internal architecture of the 80386 microprocessor.	10	4	3
	(OR)			
8.	Highlight any four features that differentiate the 80486 from the Pentium processor.	10	4	3
	<u>UNIT-V</u>			
9.	Discuss the key features of the ARM processor that make it suitable for embedded applications.	10	5	3
	(OR)			
10.	Differentiate between CPSR and SPSR in the ARM architecture.	10	5	3
	<u>UNIT-VI</u>			
11.	What are the key features of the 8051 microcontroller?	10	6	2
	(OR)			
12.	Write an assembly language program in the 8051 microcontroller to find the subtraction of 20 and 10	10	6	3

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

		Marks	CO	Blooms Level
	<u>UNIT-I</u>			
1.	Define Compiler. Explain Phases of a compiler with neat diagram. (OR)	10	1	2
2.	a) Explain about Regular Expressions.	5	1	2
	b) Discuss about bootstrapping.	5	1	3
	<u>UNIT-II</u>			
3.	a) Explain the Role of the Parser.	5	2	2
	b) Consider the Grammar $S \rightarrow ASb/ab/SS$ $A \rightarrow aA/A$, $B \rightarrow bB/A$ Give Left most derivation and Right most derivation of $aaabbb$ in G . (OR)	5	2	3
4.	Construct a Predictive parsing Table for following Grammar $\{E \rightarrow TE', E' \rightarrow +TE'/\epsilon, T \rightarrow FT', T' \rightarrow *FT'/\epsilon, F \rightarrow (E)/id\}$. G	10	2	3
	<u>UNIT-III</u>			
5.	Construct the SLR parsing Table for the following grammar G $\{S \rightarrow AA \quad A \rightarrow aA b\}$	10	3	3
	<u>UNIT-IV</u>			
6.	Construct the LALR parsing Table for the following grammar G $\{S \rightarrow AA \quad A \rightarrow aA b\}$	10	3	3
	<u>UNIT-IV</u>			
7.	a) Discuss about construction of a syntax tree	5	4	2
	b) Explain about Boolean Expressions.	5	4	2
	<u>UNIT-V</u>			
8.	Define a Three Address statement with example. Write quadruples, triples, and indirect triples for the expression $(a+b)*(c+d)*(e+f)$	10	4	2
	<u>UNIT-V</u>			
9.	a) Write about static and dynamic checking of types	5	5	2
	b) Discuss about overloading functions and operators.	5	5	2
	<u>UNIT-VI</u>			
10.	a) Explain about parameter passing.	5	5	2
	b) Explain about Symbol Table.	5	5	2
	<u>UNIT-VI</u>			
11.	a) Explain the principal sources of optimization	5	6	2
	b) Discuss about directed acyclic graph	5	6	2
	<u>UNIT-VI</u>			
12.	a) Explain the Object code forms.	5	6	2
	b) Discuss the Peephole Optimization.	5	6	2

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

<u>UNIT-I</u>		Marks	CO	Blooms Level
1.	a) Derive the general heat conduction in cylindrical coordinate system	7	1	L4
	b) What are the different types of boundary conditions?	3	1	L2
(OR)				
2.	a) Explain the electrical analogy for conduction heat transfer..	3	1	L2
	b) The slab of a room consists of a concrete layer with a thermal conductivity of 1.42 W/m·K and a thickness of 15 cm. The outer and inner temperatures are 318 K and 298 K, respectively. A false ceiling layer with a thermal conductivity of 0.17 W/m·K and a thickness of 20 mm is provided for insulation. The air gap between the layers, with a thermal conductivity of 0.026 W/m·K, is 40 cm. Determine the percentage reduction in heat infiltration	7	1	L4
<u>UNIT-II</u>				
3.	a) What are the various characteristics of fin?	3	2	L3
	b) A heat sink designed for the thermal management of electronics comprises 100 pin fins with diameter 8mm and a height of 50 mm. Air at room temperature (25°C) is forced to flow across the fins, providing a heat transfer coefficient of 17 W/m ² K. If the device is designed to maintain a maximum temperature of 67°C, determine the rate of heat dissipation from the heat sink.	7	2	L4
(OR)				
4.	a) Analyze the feasibility of using lumped heat capacity analysis for the following case: An orange with a diameter of 8 cm, initially at 32°C, is placed in a refrigerator with an ambient temperature of 18°C and a convection heat transfer coefficient of 5 W/m ² K.	4	2	L3
	b) A 50x50cm ² copper slab 6.25 mm thick has a uniform temperature of 300°C. Its temperature is suddenly lowered to 36°C. calculate the time required for the plate to reach the temperature of 108°C (Take density as 9X10 ³ kg/m ³ ; Specific heat as 0.38kJ/kg-K ; k = 370 W/m-K ; h = 90W/m ² -K)	6	2	L4
<u>UNIT-III</u>				
5.	a) What is the physical significance of momentum diffusivity (ν) and thermal diffusivity (α) and how they are related with each other?	4	3	L3
	b) Prove that Nusselt number is function of Grashof and Prandtl number in a forced convection heat transfer.	6	3	L4

(OR)

- | | | | | | |
|----|----|--|---|---|----|
| 6. | a) | Explain the formation of thermal boundary layer in free convection | 4 | 3 | L2 |
| | b) | A horizontal cylinder of 2.5 cm diameter and 0.6 m long is suspended in water at 20°C. Calculate the rate of heat transfer if the cylinder surface is at 55°C. | 6 | 3 | L3 |

UNIT-IV

- | | | | | | |
|----|----|--|---|---|----|
| 7. | a) | Differentiate the laminar and turbulent flow? | 3 | 4 | L2 |
| | b) | Atmospheric air at 400 K flows with a velocity of 8 m/s along a flat plate of length 1.5 m long. The plate has a width of 0.8 m. The total drag force acting on the plate is determined to be 0.025 N. By using Reynolds-Colburn analogy, estimate the corresponding average heat transfer coefficient for flow of air over the plate. Data at 400 K: $\rho=0.8826 \text{ kg/m}^3$, $c_p=1.014 \times 10^3 \text{ J/(kg}^\circ\text{C)}$, $Pr=0.689$. | 7 | 4 | L4 |

(OR)

- | | | | | | |
|----|----|--|---|---|----|
| 8. | a) | Differentiate between drop and film wise condensation. | 4 | 4 | L3 |
| | b) | Explain pool boiling regimes with neat sketch. | 6 | 4 | L2 |

UNIT-V

- | | | | | | |
|----|----|--|---|---|----|
| 9. | a) | What is overall heat transfer coefficient of a heat exchanger? | 3 | 5 | L2 |
| | b) | A double-pipe (shell-and-tube) heat exchanger is constructed of stainless steel ($k = 15.1 \text{ W/m }^\circ\text{C}$) inner tube of inner diameter $D_i = 1.5 \text{ cm}$ and outer diameter $D_o = 1.9 \text{ cm}$ and an outer shell of inner diameter 3.2 cm. The convection heat transfer coefficient is given to be $h_i = 800 \text{ W/m}^2 \text{ }^\circ\text{C}$ on the inner surface of the tube and $h_o = 1200 \text{ W/m}^2 \text{ }^\circ\text{C}$ on the outer surface. For a fouling factor of $R_{fi} = 0.0004 \text{ m}^2 \text{ }^\circ\text{C/W}$ on the tube side and $R_{ro} = 0.0001 \text{ m}^2 \text{ }^\circ\text{C/W}$ on the shell side, determine the overall heat transfer coefficient based on the inner surface area of the tube | 7 | 5 | L4 |

(OR)

- | | | | | | |
|-----|----|---|---|---|----|
| 10. | a) | Explain Fouling factor, LMTD. | 3 | 5 | L2 |
| | b) | Derive LMTD of a parallel flow heat exchanger | 7 | 5 | L4 |

UNIT-VI

- | | | | | | |
|-----|----|---|---|---|----|
| 11. | a) | Write short notes on view-factor | 3 | 6 | L2 |
| | b) | Calculate the radiation heat loss per meter length of 5.2 cm OD steel pipe carrying steam at 200°C and passing through a centre of 50 cm by 50 cm galvanized iron duct at 25°C and whose outer surface is insulated. The emissivity of steel is 0.75 and that of the galvanized iron is 0.30. | 7 | 6 | L4 |

(OR)

- | | | | | | |
|-----|----|---|---|---|----|
| 12. | a) | Two perfectly black, parallel disks, 1 m in diameter are separated by distance of 0.25m. One disk is kept at 60°C while the other held at 20°C. the discs are placed in a large room whose walls are maintained at 40°C. determine net radiation heat exchange (i) between the disks (ii) between disks and the room. | 7 | 6 | L4 |
| | b) | What are the various modes of mass transfer describing briefly? | 3 | 6 | L2 |

AR18

CODE: 18EET316

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

III B.Tech II Semester Supplementary Examinations, July,2025

**INDUSTRIAL AUTOMATION
(ELECTRICAL AND ELECTRONICS ENGINEERING)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) Discuss the historical evolution of industrial automation and the factors that led to its development 6M
b) Explain the functional components of a PLC system 6M
(OR)
2. a) Explain the Classification of Industrial Automation 6M
b) Explain the control & sensing elements in industrial automation. 6M

UNIT-II

3. Draw and explain the architecture of PLC 12M
(OR)
4. a) Explain the concepts of sourcing and sinking in PLC input/output circuits. 6M
b) Explain the field devices used in PLC systems for input and output operations 6M

UNIT-III

5. a) Discuss the relay ladder logic methodology in PLC programming. 6M
b) Develop the digital logic gates with their PLC equivalents. 6M
(OR)
6. Organize different steps involved in large process ladder diagram construction. 12M

UNIT-IV

7. Discuss on-delay and off-delay timer functions with industrial applications. 12M
(OR)
8. a) Describe the function of latching in PLC programming and provide an example of its application in an industrial process. 6M
b) Discuss the arithmetic functions available in PLCs, including addition, subtraction, multiplication, and division. 6M

UNIT-V

9. a) Describe the historical development of SCADA systems. 6M
b) Differentiate between the roles of an RTU and an MTU in a SCADA system. 6M
(OR)
10. a) Compare discrete and analogue control systems. 6M
b) Discuss about SCADA interface. 6M