

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

**UNIT-I**

- |  | Marks | CO | BTL |
|--|-------|----|-----|
| 1. a) Using the Law of Demand, construct a narrative explaining a significant plunge in demand for luxury cars during economic downturns.                          | 7     | 1  | K2  |
| b) Illustrate through a diagram the impact of technological advancement on the supply curve of electronic gadgets and describe the underlying economic principles. | 7     | 1  | K2  |

**(OR)**

- |  |   |   |    |
|--|---|---|----|
| 2. a) Explain with examples, how managerial economics helps in making decisions regarding risk assessment and uncertainty in business operations.                          | 7 | 1 | K2 |
| b) Assume the government implements a tax on sugar-sweetened beverages. Use the concepts of supply and demand to discuss the potential market consequences of this policy. | 7 | 1 | K2 |

**UNIT-II**

- |  |   |   |    |
|--|---|---|----|
| 3. a) Create a hypothetical scenario to illustrate using the expert opinion method for demand forecasting of a seasonal product and discuss potential biases that could affect forecasting accuracy. | 7 | 2 | K2 |
| b) Discuss the importance of considering both demand elasticity and forecast demand while making pricing decisions for a new product launch.   | 7 | 2 | K2 |

**(OR)**

- |   |   |   |    |
|---|---|---|----|
| 4. a) Based on the judgmental approach to demand forecasting, what strategic decisions can a company make to optimize stock levels before a major shopping holiday?             | 7 | 2 | K2 |
| b) If the demand forecasting estimate for a consumer good was inaccurately high, what can be inferred about the elasticity type of this product based on its sales performance? | 7 | 2 | K2 |

**UNIT-III**

- |   |   |   |    |
|---|---|---|----|
| 5. a) Analyze a scenario where a company uses a Cobb-Douglas production function with specific inputs. Given the production function $Q = L^{0.3} K^{0.7}$ , where Q is the output, L is labor input, and K is capital input, calculate the output when L = 100 and K = 50. | 7 | 3 | K3 |
| b) Illustrate with a detailed explanation how the movement along an isoquant and corresponding changes in the Isocost line reflect the substitution of labor for capital, maintaining the same level of output.   | 7 | 3 | K2 |

**(OR)**

6. a) Design a break-even analysis model for a product with the following details: Fixed costs are \$200,000, the price per unit is \$50, and the variable cost per unit is \$30. Determine the break-even quantity and interpret the managerial significance of this point. 7 3 K3
- b) Discuss the key cost concepts relevant in production theory, including the differences between fixed, variable, and total costs, and how these costs influence business decisions. 7 3 K2

#### **UNIT-IV**

7. a) Explain the concept of 'Market Structures' and how understanding these structures help businesses in strategic decision-making. Relate your discussion to at least three different types of market structures. 7 4 K2
- b) Create a business scenario where a company transitions from a monopolistic competition to a more oligopolistic market structure due to strategic mergers and acquisitions. What changes would you expect in the business's pricing and output decisions? 7 4 K2

#### **(OR)**

8. A project requires initial investment of Rs.50,000. Life of the project is 4 years, scrap value is negligible. Cash flows after tax for four years are Rs.15000, 15000, 20000 and 25000 respectively. Find out whether the project is acceptable or not by using NPV and Pay Back Period Method. 14 4 K3

#### **UNIT-V**

9. a) Mention the feature and functions of accounting 7 5 K2
- b) Explain the significance of Ratio Analysis. 7 5 K2

#### **(OR)**

10. 

Liabilities	Amount	Assets	Amount
Equity Share Capital	5,00,000	Land & Building	1,00,000
Preference Share Capital	2,00,000	Machinery	4,00,000
General Reserve	1,00,000	Furniture	50,000
Secured Loan	3,00,000	Inventory	3,00,000
Sundry Creditors	1,00,000	Sundry Debtors	3,00,000
		Cash/Bank Balance	50,000
	12,00,000		12,00,000

 14 5 K3
- Calculate following Ratios from the above Balance Sheet  
 1. Current Ratio 2. Liquid Ratio 3. Working Capital Ratio 4. Debt Equity Ratio 5. Capital Gearing Ratio

**SURVEYING  
(Civil ENGINEERING)****Time: 3 Hours****Max Marks: 70**

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**UNIT-I**Marks CO Blooms  
Level

1. a) A surveyor takes perpendicular offsets from a baseline at intervals of 10 m. The offsets are 2.5 m, 3.0 m, 3.8 m, 4.5 m, 5.2 m, and 6.0 m. Determine the area enclosed using Simpson's Rule.
- b) Explain the classification of surveying based on instruments used.

8	1	4
6	2	3

**(OR)**

2. a) Describe an offset survey for an open ground with a neat sketch.
- b) Explain the sources of errors in surveying.

8	1	4
6	1	3

**UNIT-II**

3. a) The following fore and back bearings were observed in traversing with a compass in place where local attraction was suspected.

8	2	4
---	---	---

Line	F.B	B.B
AB	38°30'	219°15'
BC	100°45'	278°30'
CD	25°45'	207°15'
DE	325°15'	145°15'

Find the corrected fore and back bearings.

- b) Explain the temporary adjustments of compass survey.

6	2	3
---	---	---

**(OR)**

4. a) Define the following terms:  
i) Declination ii) Isogonic lines  
iii) Agonic lines iv) Local attraction
- b) Explain the process of compass survey to locate the ground features of a residential building with a neat sketch.

8	2	2
6	2	4

### **UNIT-III**

5. a) During a construction work, the bottom of a R.C. Sunshade A was taken as a temporary B.M. (R.L. +100.000). The following notes were recorded:  
Reading on inverted staff on B.M. at A. 2.50  
Reading on peg P on ground: 1.56  
Change of Instrument  
Reading on peg P on ground: 0.75  
Reading on inverted staff on bottom of slab B. 3.00  
Enter the readings in a level book page and calculate the R.L of Slab B.  
Note: All the units are in metres
- b) Explain the methods of levelling. 6 3 3
- (OR)
6. a) How can contour surveys help in land development and site planning? 8 3 3
- b) Define contouring and write its uses and applications. 6 3 2

### **UNIT-IV**

7. a) Explain the temporary measurements of theodolite survey. 8 4 3
- b) Determine the distance between the instrument station P and the staff station Q from the following data:  
R.L of the instrument axis = 200.150 m  
Vertical angle =  $-3^{\circ}45'$   
Staff readings = 1.450, 0.900, 0.350 m
- (OR)
8. a) Explain the relationship between radius of curve and degree of curve. 7 4 3
- b) Write the advantages and applications of tacheometric survey. 7 4 2

### **UNIT-V**

9. a) Explain the step-by-step process of conducting a drone survey, from planning to data processing. 8 5 3
- b) Discuss how drone surveys are used in construction and infrastructure development. Provide examples. 6 5 4
- (OR)
10. a) Explain about relief and tilt displacements. 8 5 3
- b) What is the purpose of aerial photography and what are its factors to be assessed? 6 5 4

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**UNIT-I**

- |       |   | Marks | CO  | Blooms Level |
|-------|---|-------|-----|--------------|
| 1. a) | Describe the services provided by an operating system and their significance.   | 7M    | CO1 | L2           |
| b)    | Draw the Gantt chart and calculate the average Waiting Time for these processes using the Shortest Remaining Time First (SRTF) algorithm. | 7M    | CO1 | L3           |

Process No	Arrival Time (ms)	Burst Time (ms)
1	20	0
2	25	15
3	10	30
4	15	45

**(OR)**

- |       |  |    |     |    |
|-------|--|----|-----|----|
| 2. a) | Analyze various scheduling criteria and explain how they affect the selection of a scheduling algorithm. | 7M | CO1 | L4 |
| b)    | Explain about the Round Robin algorithm with an example?   | 7M | CO1 | L2 |

**UNIT-II**

- |       |  |    |     |    |
|-------|--|----|-----|----|
| 3. a) | Define process synchronization and explain the critical section problem.     | 7M | CO2 | L1 |
| b)    | Illustrate the steps involved in deadlock detection and recovery mechanisms. | 7M | CO2 | L3 |

**(OR)**

- |       |  |    |     |    |
|-------|--|----|-----|----|
| 4. a) | Analyze and explain the four necessary conditions for deadlock with real-world examples.                 | 7M | CO2 | L4 |
| b)    | What is Semaphore? How can we achieve the synchronization using semaphore for producer consumer problem? | 7M | CO2 | L2 |

### **UNIT-III**

5. a) Describe the difference between paging and segmentation with neat diagrams. 7M CO3 L2  
b) Analyze causes of thrashing and suggest methods to avoid thrashing in a system. 7M CO3 L4

**(OR)**

6. a) Calculate the number of page faults using LRU page replacement algorithm when references to pages occur in the following order: 1, 2, 4, 5, 2, 1, 2, 4. Assume that main memory can accommodate 3 pages and the main memory already has the pages 1 and 2, with page one having brought earlier than page 2. 7M CO3 L2  
b) Explain the Optimal page replacement algorithm. 7M CO3 L2

### **UNIT-IV**

7. a) List and explain various file access methods with examples. 7M CO4 L1  
b) Define Directory. Determine the most common schemes for defining the logical structure of a directory? 7M CO4 L2

**(OR)**

8. a) List disadvantages of using a single directory. 7M CO4 L2  
b) Illustrate how indexed allocation works for a file with multiple data blocks. 7M CO4 L3

### **UNIT-V**

9. a) Demonstrate how I/O buffering works and how it improves device communication. 7M CO5 L3  
b) Explain the key components of mass-storage structures and their significance in a computer system. 7M CO5 L2

**(OR)**

10. Given a moving-head disk with 200 tracks (numbered 0 to 199), the disk head is currently at track 143 after completing a request at track 125. The queue of requests is in FIFO order: 86, 147, 91, 177, 94, 150, 102, 175, and 130. Calculate the total head movement required to satisfy these requests using the First-Come, First-Served (FCFS), Scan, and Shortest Seek Time First (SSTF), C-SCAN (Circular Scan), and Look disk scheduling algorithms. 14M CO5 L3

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	<b><u>UNIT-I</u></b>	Marks	CO	Blooms Level
1.	a) Discuss the function of each block of communication system	7M	1	K2
	b) Compare different AM techniques DSB, SSB & VSB.	7M	1	K2
	<b>(OR)</b>			
2.	a) Draw the waveforms and spectrum of Amplitude Modulation (AM) for an arbitrary baseband signal $x(t)$ .	7M	1	K2
	b) An AM transmitter radiates 9kW of power when the carrier is un-modulated and 10.125kW of power when the carrier is sinusoidal modulated. Find the modulation index & Percentage modulation. Now if another sine wave corresponding to 40% modulation is transmitted Simultaneously. Calculate total radiated power	7M	1	K3
	<b><u>UNIT-II</u></b>			
3.	a) Define modulation index, carrier swing and percentage modulation of FM	7M	2	K1
	b) Discuss the necessity of each block of indirect FM method	7M	2	K2
	<b>(OR)</b>			
4.	a) Derive the expression for single - tone frequency modulation with necessary waveforms.	7M	2	K2
	b) Compare slope detector and balanced slope detector.	7M	2	K2
	<b><u>UNIT-III</u></b>			
5.	a) Write the differences between PAM, PWM, and PPM?	7M	3	K2
	b) Describe about quantization error	7M	3	K2
	<b>(OR)</b>			
6.	a) Discuss PWM and PPM in detail.	7M	3	K2
	b) Briefly discuss about delta modulation	7M	3	K2
	<b><u>UNIT-IV</u></b>			
7.	a) Discuss the concepts of FSK with bit rate and bandwidth.	7M	4	K2
	b) Compare the Quadrature Phase Shift Keying and Binary Phase Shift Keying	7M	4	K2
	<b>(OR)</b>			
8.	a) Draw the QPSK transmitter block diagram and state the concepts in your own words with relevant expressions.	7M	4	K2
	b) If a digital message input data rate is 8kbps and average energy per bit is 0.01 Unit. Infer the bandwidth required for the transmission of message through BPSK, QPSK, BFSK & 16 PSK.	7M	4	K3
	<b><u>UNIT-V</u></b>			
9.	a) Briefly explain the operation of super heterodyne receiver	7M	5	K2
	b) Write the differences between pre-emphasis and de-emphasis	7M	5	K2
	<b>(OR)</b>			
10.	a) Discuss about different noises in AM and FM receivers	7M	5	K2
	b) Write the uses of matched filter and optimum filter	7M	5	K2

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**UNIT-I**

- |   | Marks | CO | BTL |
|---|-------|----|-----|
| 1. a) Explain the operation of a DC generator with neat diagram | 8     | 1  | K2  |
| b) What is armature reaction? Explain with neat sketch          | 6     | 1  | K2  |

(OR)

- |   |    |   |    |
|---|----|---|----|
| 2. a) What are the different methods of excitation of a DC generator  | 4  | 1 | K2 |
| b) A dc series generator supplies 150 A at 100 V. The resistance of armature, series field and shunt field windings are 0.04, 0.02 and 65 $\Omega$ respectively. Determine the e.m.f generated. | 10 | 1 | K3 |

**UNIT-II**

- |   |    |   |    |
|---|----|---|----|
| 3. a) Explain the principle of operation of a DC motor with a neat sketch | 10 | 2 | K2 |
| b) What are the applications of a DC motor?                               | 4  | 2 | K2 |

(OR)

- |  |   |   |    |
|--|---|---|----|
| 4. a) Explain the speed torque characteristics of a DC motor | 7 | 2 | K2 |
| b) What is Back emf? Explain in detail                       | 7 | 2 | K2 |

**UNIT-III**

- |  |   |   |    |
|--|---|---|----|
| 5. a) Explain with diagram how Hopkinson's test is performed on dc machines. What are the advantages and disadvantages of this test? | 7 | 3 | K2 |
| b) Explain field control method for speed control of a DC shunt machine?   | 7 | 3 | K2 |

(OR)

- |   |   |   |    |
|---|---|---|----|
| 6. a) Explain Swinburne's test and its importance   | 7 | 3 | K2 |
| b) A 220 V shunt motor has an armature resistance of 0.35 $\Omega$ and takes armature current of 10 A on full-load. The electromagnetic torque being constant, by how much must the flux be reduced to increase the speed by 25%? | 7 | 3 | K3 |

**UNIT-IV**

- |  |   |   |    |
|--|---|---|----|
| 7. a) Discuss the principle of operation of transformer and derive the emf equation  | 7 | 4 | K2 |
| b) A single-phase transformer supplies a load of 20 kVA at a p.f. of 0.8 (lagging). The iron loss of the transformer is 200 W and the copper losses at this load is 180 W. Calculate (i) the efficiency (ii) the new efficiency if the load is now changed to 30 kVA at a p.f. of 0.9 (lagging). | 7 | 4 | K3 |

(OR)

- |  |   |   |    |
|--|---|---|----|
| 8. a) Distinguish between core-type and shell-type transformer. Why is the low voltage winding placed near the core? Why is the core of a transformer laminated? | 7 | 4 | K2 |
| b) Draw the phasor diagram of single-phase transformer with leading p.f  | 7 | 4 | K2 |

**UNIT-V**

- |   |    |   |    |
|---|----|---|----|
| 9. A 200 kVA, 2000/440V, 50 Hz, single phase transformer gave the following test results:<br>O.C. test: 2000V, 1.8A, 1.75 kW on HV side<br>S.C. test: 13V, 300V, 1 kW on LV side<br>Obtain the equivalent circuit as referred to HV side. | 14 | 5 | K3 |
|---|----|---|----|

(OR)

- |   |   |   |    |
|---|---|---|----|
| 10. a) Discuss about Sumpner's test on a single-phase transformer.                                    | 7 | 5 | K2 |
| b) What is auto-transformer? Explain with a neat sketch. Mention few applications of auto transformer | 7 | 5 | K2 |



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		Marks	CO	Blooms Level
<b>UNIT-I</b>				
1.	a) Explain the role of the <b>kernel</b> in an operating system. How does an operating system manage hardware resources?	7M	1	K2
	b) Describe the role of the <b>operating system</b> in process management, memory management, file system management, and device management.	7M	1	K2
<b>(OR)</b>				
2.	a) Discuss process scheduling in detail. Explain different types of schedulers	7M	1	K2
	b) Describe pre-emptive and non-pre-emptive scheduling algorithms. Compare their performance and explain situations where each is preferred.	7M	1	K2
<b>UNIT-II</b>				
3.	a) Explain the concept of <b>process synchronization</b> and its importance in concurrent programming.	7M	2	K2
	b) Define the <b>Critical-Section Problem</b> and explain why it occurs in multiprogramming environments	7M	2	K2
<b>(OR)</b>				
4.	a) Explain <b>Peterson's Solution</b> to the <b>Critical-Section Problem</b> in detail.	7M	2	K2
	b) Describe how <b>atomic operations</b> help in process synchronization.	7M	2	K2
<b>UNIT-III</b>				
5.	a) Define <b>deadlock</b> in an operating system and explain its causes.	7M	3	K2
	b) Describe <b>Banker's Algorithm</b> for deadlock avoidance, including its working principles and steps.	7M	3	K2
<b>(OR)</b>				
6.	a) What is <b>deadlock detection</b> , and how does it differ from deadlock avoidance?	7M	3	K2
	b) Discuss the role of the <b>Memory Management Unit (MMU)</b> in implementing virtual memory.	7M	3	K2
<b>UNIT-IV</b>				
7.	a) What is a <b>file</b> in an operating system? Explain its structure and significance.	7M	4	K2
	b) Discuss the role of <b>file extensions</b> and their importance in file management.	7M	4	K2
<b>(OR)</b>				
8.	a) What is <b>direct file access</b> , and how does it differ from sequential access?	7M	4	K2
	b) What is a <b>directory structure</b> , and why is it necessary in file systems?	7M	4	K2
<b>UNIT-V</b>				
9.	a) Compare <b>volatile and non-volatile storage</b> , giving real-world examples.	7M	5	K2
	b) Discuss how <b>device drivers</b> interact with block and character devices in an OS.	7M	5	K2
<b>(OR)</b>				
10.	a) What is the <b>SCAN (Elevator Algorithm)</b> , and how does it improve disk performance?	7M	5	K2
	b) Define <b>block devices</b> and <b>character devices</b> in an operating system.	7M	5	K2

**1.a) Explain arithmetic operators in python with an example.**

Operator	Description	Example	Result
+	Addition	5 + 2	7
-	Subtraction	5 - 2	3
*	Multiplication	5 * 2	10
/	Division (float)	5 / 2	2.5
//	Floor Division	5 // 2	2
%	Modulus (remainder)	5 % 2	1
**	Exponentiation	5 ** 2	25

```
a = 10
```

```
b = 3
```

```
print("Addition:", a + b)    # 13
```

```
print("Subtraction:", a - b) # 7
```

```
print("Multiplication:", a * b) # 30
```

```
print("Division:", a / b)    # 3.333...
```

```
print("Floor Division:", a // b) # 3
```

```
print("Modulus:", a % b)     # 1
```

```
print("Exponentiation:", a ** b) # 1000
```

**b)****Explain about conditional operators in python.**

Operator	Description	Example	Result
==	Equal to	5 == 5	True
!=	Not equal to	5 != 3	True
>	Greater than	5 > 3	True
<	Less than	5 < 3	False
>=	Greater than or equal to	5 >= 5	True
<=	Less than or equal to	5 <= 2	False

```
x = 10
```

```
y = 5
```

```
print("x == y:", x == y)    # False
```

```
print("x != y:", x != y)    # True
```

```
print("x > y:", x > y)      # True
```

```
print("x < y:", x < y)      # False
```

```
print("x >= y:", x >= y)    # True
```

```
print("x <= y:", x <= y)    # False
```

2. a) The Assemblers, Compilers, and Interpreters are the translators to convert source code into machine code. In this regard, what are Assemblers? Explain your answer. How are Assemblers different from Compilers and Interpreters?

An **Assembler** is a **translator program** that converts **assembly language** code (low-level human-readable mnemonics) into **machine code** (binary instructions) that a computer's CPU can execute directly.

Feature	Assembler	Compiler	Interpreter
Input Language	Assembly language	High-level language (e.g., C, Java)	High-level language
Output	Machine code	Machine code (or intermediate code)	Executes line-by-line
Speed	Fast	Fast (after compilation)	Slower (interprets line-by-line)
Translation Time	Once, before execution	Once, before execution	During execution
Error Reporting	After entire code is checked	After entire code is checked	Line-by-line
Example Tool	NASM, MASM	GCC, javac	Python, JavaScript interpreters

**b) What will be the output of the following code snippet?  
Explain your answer.  
`print(2 * 3 ** 3 * 4)`**

1. Exponentiation first:  $3 ** 3 = 27$
2. Now the expression is:  $2 * 27 * 4$
3. Multiplication is left-associative, so evaluate left to right:  $2 * 27 = 54$      $54 * 4 = 216$

3.a) Explain built-in function of list.			
Function	Description	Example	Output
<code>len()</code>	Returns the number of items in the list	<code>len([10, 20, 30])</code>	3
<code>max()</code>	Returns the maximum value in the list	<code>max([4, 1, 7])</code>	7
<code>min()</code>	Returns the minimum value in the list	<code>min([4, 1, 7])</code>	1
<code>sum()</code>	Returns the sum of numeric list elements	<code>sum([1, 2, 3])</code>	6
<code>sorted()</code>	Returns a new sorted list	<code>sorted([3, 1, 2])</code>	[1, 2, 3]
<code>list()</code>	Converts other data types to a list	<code>list("abc")</code>	['a', 'b', 'c']
Method	Description	Example	Result
<code>append(x)</code>	Adds an item x to the end of the list	<code>lst.append(5)</code>	[1, 2, 3, 5]
<code>insert(i, x)</code>	Inserts item x at index i	<code>lst.insert(1, 10)</code>	[1, 10, 2, 3]
<code>extend(lst2)</code>	Adds elements of another list	<code>lst.extend([4,</code>	[1, 2, 3, 4, 5]

		5])	
pop()	Removes and returns last item	lst.pop()	Removes last element
pop(i)	Removes and returns item at index i	lst.pop(0)	Removes first element
remove(x)	Removes first occurrence of value x	lst.remove(3)	Removes value 3
clear()	Removes all elements from the list	lst.clear()	[]
index(x)	Returns first index of value x	lst.index(3)	Index of 3
count(x)	Counts how many times x occurs in the list	lst.count(2)	Number of times 2 appears
reverse()	Reverses the list in place	lst.reverse()	List is reversed
sort()	Sorts the list in place	lst.sort()	List is sorted

Any5-5Marks

- b) What will be the output of the following code snippet? Explain your answer.  
**thistuple = ("apple", "banana", "cherry", "orange", "kiwi", "melon", "mango")**  
**print(thistuple[-4:-1])**

('orange', 'kiwi', 'melon')

- 4a) Produce the following output using nested for loops in Python.

```
12345
23451
34512
45123
51234
```

```
for i in range(5):
    for j in range(5):
        print((i + j) % 5 + 1, end="")
    print()
```

- b) What will be the output of the following code snippet? Explain your answer.

```
thisset = {"apple", "banana", "cherry"}
x = thisset.pop()
print(x)
print(thisset)
```

```
apple
{'banana', 'cherry'}
```

5. a) Write a Python program to get a new string from a given string where "Is" has been added to the front. If the given string already begins with "Is" then return the string unchanged.

```
def add_is_prefix(input_str):
```

```

if input_str.startswith("Is"):
    return input_str
else:
    return "Is" + input_str

```

```

# Example usage
print(add_is_prefix("Array")) # Output: IsArray
print(add_is_prefix("IsEmpty")) # Output: IsEmpty

```

**b) Write a Python program to accept a filename from the user and print the extension of that.**

```

filename = input("Enter the filename: ")
parts = filename.split(".")
if len(parts) > 1:
    print("The extension of the file is:", parts[-1])
else:
    print("No extension found.")

```

**6. a) Write a Python program to show Fibonacci sequence using Iteration as well as Recursion.**

```

def fib(n):
    if n <= 1:
        return n
    else:
        return fib(n - 1) + fib(n - 2)

```

<b>6b) Explain input-output operation of files.</b>	
Mode	Description
'r'	Read (default). File must exist.
'w'	Write. Creates new file or overwrites.
'a'	Append. Adds data to end of file.
'b'	Binary mode (e.g., 'rb', 'wb')
'+'	Update (read/write). E.g., 'r+'

**7. a) Define a module named 'geometry.py' in Python script. Inside this module, define functions for calculating the area and perimeter of geometric shapes like squares, rectangles, circles, etc. Then, write another Python script to import this module and use the functions to calculate the area and perimeter of different shapes.**

```

import math
def area_square(side):
    return side * side
def perimeter_square(side):
    return 4 * side
def area_rectangle(length, width):
    return length * width
def perimeter_rectangle(length, width):
    return 2 * (length + width)
def area_circle(radius):
    return math.pi * radius * radius
def perimeter_circle(radius):

```

```
return 2 * math.pi * radius
```

- b) **Write a Python program using the *os* module to get and change the current working directory.**

```
import os
current_dir = os.getcwd()
print("Current Working Directory:", current_dir)
new_dir = os.path.dirname(current_dir)
os.chdir(new_dir)
print("New Working Directory:", os.getcwd())
```

8. a) **Explain the concept of built-in modules and user-defined modules with examples.**

Built-in modules are **predefined libraries** provided by Python. You can directly import and use them without needing to install or define them.

### Examples of Built-in Modules:

- `math` – for mathematical functions.
- `os` – for interacting with the operating system.
- `random` – for generating random numbers.
- `datetime` – for date and time manipulation.

User-defined modules are **Python files created by the user**. You define functions, variables, or classes inside them and use them in other Python scripts. Any example

- b) **Write a Python program that demonstrates class inheritance with a parent and child class.**

```
# Parent class
class Animal:
    def __init__(self, name):
        self.name = name
    def speak(self):
        print(f'{self.name} makes a sound.')
# Child class (inherits from Animal)
class Dog(Animal):
    def speak(self):
        print(f'{self.name} says Woof!')
# Another child class (inherits from Animal)
class Cat(Animal):
    def speak(self):
        print(f'{self.name} says Meow!')
# Creating objects
a = Animal("Generic Animal")
d = Dog("Buddy")
c = Cat("Whiskers")
# Calling methods
a.speak() # Output: Generic Animal makes a sound.
d.speak() # Output: Buddy says Woof!
```

```
c.speak() # Output: Whiskers says Meow!
```

- 9. a) Write a Python Program to create a class by name Students, and initialize attributes like name, age, and grade while creating an object.**

```
class Students:
    def __init__(self, name, age, grade):
        self.name = name
        self.age = age
        self.grade = grade

    def display(self):
        print(f"Name: {self.name}")
        print(f"Age: {self.age}")
        print(f"Grade: {self.grade}")

# Creating an object of Students
student1 = Students("Jaya", 17, "11th Grade")

# Displaying student information
student1.display()
```

- b) Create a Python class to reverse a string word by word.  
Input string: 'hello .py'  
Expected Output : '.py hello'**

```
class StringReverser:
    def __init__(self, input_string):
        self.input_string = input_string

    def reverse_words(self):
        words = self.input_string.split() # Split the string into words
        reversed_words = words[::-1] # Reverse the list of words
        return ' '.join(reversed_words) # Join them back into a string

# Example usage
s = StringReverser("hello .py")
output = s.reverse_words()
print("Reversed string:", output)
```

- 10. a) Write a Python class named Student with two attributes student name, marks. Modify the attribute values of the said class and print the original and modified values of the said attributes.**

```
class Student:
    def __init__(self, name, marks):
        self.name = name
        self.marks = marks

    def display(self):
        print(f"Name: {self.name}, Marks: {self.marks}")

# Creating an object of the Student class
student1 = Student("Jaya", 85)
```

```
# Displaying original values
print("Original Values:")
student1.display()
```

```
# Modifying the attribute values
student1.name = "Laxmi"
student1.marks = 92
```

```
# Displaying modified values
print("Modified Values:")
student1.display()
```

- b) Create a Python class to check the validity of a string of parentheses, '(', ')', '{', '}', '[' and ']'. These brackets must be closed in the correct order, for example "()" and "[]{}" are valid but "]", "{()}" and "{{{" are invalid.**

```
class ParenthesesValidator:
    def __init__(self, input_string):
        self.input_string = input_string

    def is_valid(self):
        stack = []
        bracket_map = {'(': ')', '{': '}', '[': ']'}

        for char in self.input_string:
            if char in bracket_map.values():
                stack.append(char) # Opening brackets
            elif char in bracket_map:
                if not stack or stack[-1] != bracket_map[char]:
                    return False # Mismatched or empty stack
                stack.pop()
            else:
                # Ignore characters other than brackets (optional)
                continue

        return not stack # True if all brackets closed
```

```
# Example usage
inputs = ["()", "()[]{}", "[]", "{()}", "{{{"]
```

```
for s in inputs:
    validator = ParenthesesValidator(s)
    print(f"Input: {s} -> Valid: {validator.is_valid()}")
```

11.	a)	Is it possible to escape all special characters with backslashes? Explain your answer.
Escape	Meaning	
\ '	Single quote	



\"	Double quote
\\	Backslash
\n	Newline
\t	Tab
\r	Carriage return
\b	Backspace
\f	Form feed
\a	Bell (alert)

- b) Develop a Python program that matches a string that has an 'a' followed by zero or more b's.**

```
import re

# Function to check the pattern
def match_ab_pattern(string):
    pattern = r"ab*" # 'a' followed by 0 or more 'b's
    if re.fullmatch(pattern, string):
        print(f"Match found: '{string}' is valid")
    else:
        print(f"No match: '{string}' is invalid")

# Test cases
test_strings = ["a", "ab", "abb", "abbbb", "ac", "ba", "b", ""]

for s in test_strings:
    match_ab_pattern(s)
```

- 12. a) Write a Regular Expression in Python to validate an email address pattern.**

```
import re

# Function to validate email address
def validate_email(email):
    pattern = r'^[a-zA-Z0-9._%+-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}$'

    if re.fullmatch(pattern, email):
        print(f"Valid Email: {email}")
    else:
        print(f"Invalid Email: {email}")

# Test cases
emails = [
    "user@example.com",
    "john.doe123@my-site.co",
    "invalid-email@.com",
    "noatsymbol.com",
```

```
"name@domain",  
"user@domain.c"  
]
```

for email in emails:

    validate\_email(email)

**b) Develop a Python program to replace whitespaces with an underscore and vice versa.**

def replace\_characters(text, mode):

    if mode == "to\_underscore":

        return text.replace(" ", "\_")

    elif mode == "to\_space":

        return text.replace("\_", " ")

    else:

        return "Invalid mode selected."

**PULSE AND DIGITAL CIRCUITS**  
**(ELECTRONICS AND COMMUNICATION 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

<u><b>UNIT-I</b></u>			Marks	CO	Blooms Level
1.	a	Prove that a low pass circuit acts as an integrator.	5M	CO1	Apply
	b	Discuss about attenuators.	5M	CO1	Knowledge
<b>(OR)</b>					
2.		Draw the response of an RC high pass circuit when applied with Ramp input.	10M	CO1	Apply
<u><b>UNIT-II</b></u>			Marks	CO	Blooms Level
3.	a	Explain transfer characteristics of emitter coupled clipper and derive necessary equations.	5M	CO2	Knowledge
	b	Compare series diode and shunt diode clippers?	5M	CO2	Understand
<b>(OR)</b>					
4.	a	State and prove clamping circuit theorem?	5M	CO2	Apply
	b	Give the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics	5M	CO2	Knowledge
<u><b>UNIT-III</b></u>			Marks	CO	Blooms Level
5.		Explain with the help of suitable waveforms the switching times of a diode switch. Derive the expression for reverse recovery time.	10M	CO3	Knowledge
<b>(OR)</b>					
6.	a	Distinguish between unsymmetrical and Symmetrical triggering? Why it is used?	5M	CO4	Understand
	b	What are different types of multivibrators? Explain the stable state and quasi stable state of a multivibrator.	5M	CO4	Knowledge
<u><b>UNIT-IV</b></u>			Marks	CO	Blooms Level
7.		Explain the operation of a Monostable multivibrator and derive for the pulse width with necessary waveforms & circuits.	10M	CO4	Knowledge
<b>(OR)</b>					
8.	a	Draw the circuit diagram of collector coupled astable multivibrator and derive the expression for frequency of oscillation of an astable multivibrator.	5M	CO4	Apply
	b	Design and draw a collector-coupled ONE-SHOT using silicon npn transistors with $h_{fe(min)} = 20$ . In stable state, the transistor in cut-off has $V_{BE} = -1V$ and the transistor in saturation has base current, $I_B$ which is 50% excess of the $I_{B(min)}$ value. Assume $V_{CC} = 8V$ , $I_{C(sat)} = 2mA$ , delay time = 2.5ms & $R_1 = R_2$ . Find $R_C$ , $R_1$ , $C$ and $V_{BB}$ .	5M	CO4	Apply

<u><b>UNIT-V</b></u>			Marks	CO	Blooms Level
9.	a	With the help of a neat circuit diagram and waveforms, explain the working of a transistor bootstrap time base generator?	5M	CO5	Knowledge
	b	Find the component values of a bootstrap sweep generator, Given $V_{CC} = 18\text{ V}$ , $I_{C(sat)} = 2\text{ mA}$ and $h_{fe(min)} = 30$ .	5M	CO5	Apply
<b>(OR)</b>					
10.	a	Define and derive the terms slope error, displacement error and transmission error and also derive the relationship between them.	7M	CO5	Analyze
	b	List out the different methods for generating time base waveforms	3 M		Knowledge

<u><b>UNIT-VI</b></u>			Marks	CO	Blooms Level
11.		Draw the circuit of FOUR-DIODE sampling gate. Derive expressions for its gain (A) and $V_{min}$ ?	10M	CO6	Apply
<b>(OR)</b>					
12.		Explain about unidirectional diode sampling gate. Write its advantages and disadvantages.	10M	CO6	Knowledge

**DESIGN AND ANALYSIS OF ALGORITHMS**  
(Common TO CSE & IT Branches)

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) Rank the following functions by increasing order of asymptotic complexity:  $2^n$ ,  $n^{\log_2 n}$ ,  $64n$ ,  $\sqrt[n]{n}$ ,  $n^2$
- b) Prove that  $f(n) = \sqrt{n}$  is  $\Omega \log_2 n$ . Additionally, plot the graph that illustrates this equivalence.

Marks CO Blooms  
Level

5 CO1 K2

5

(OR)

2. Create a recurrence relation and apply the Masters' Theorem Method to find its time complexity.

$$T(n) = 4T\left(\frac{n}{2}\right) + n^2 \log^2 n$$

$$T(n) = 2T\left(\frac{n}{2}\right) + \frac{n}{\log n}$$

10 CO1 K3

**UNIT-II**

3. a) Compare Divide and Conquer and Dynamic programming methodologies.
- b) Write an algorithm to merge 2 sorted arrays into a single sorted array.

5 CO2 K2

5

(OR)

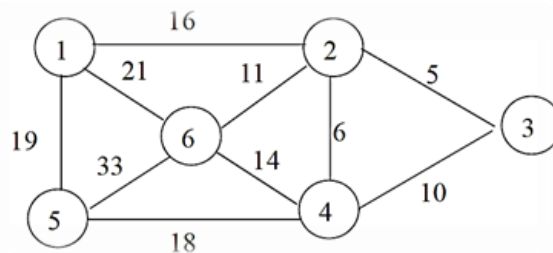
4. Write pseudo code to multiply two large integers, each of n digits using divide and conquer method. Describe your method by taking an example of  $23 \times 14$ . How can you improve the complexity of the divide and conquer way? Compare it with the traditional way.

10 CO2 K3

**UNIT-III**

5. Use Prim's algorithm to find a minimum spanning tree T in the following weighted graph. What is the total weight of T? Show step by step.

10 CO3 K2



(OR)

6. a) Let us consider that the capacity of the knapsack  $W = 60$  and the list of provided items are shown in the following table: 10 CO3 K3

Item	A	B	C	D
Profit	280	100	120	120
Weight	40	10	20	24
Ratio ( $pi/wi$ )	7	10	6	5

Find the optimal solution for gaining maximum profit.

#### UNIT-IV

7. Write greedy algorithm for knapsack problem. 10 CO4 K3  
Find an optimal solution to the knapsack instance  $n=7$ ,  
 $m=15, (p_1, p_2, \dots, p_7) = (10, 5, 15, 7, 6, 18, 3)$  and  
 $(w_1, w_2, \dots, w_7) = (2, 3, 5, 7, 1, 4, 1)$ .

(OR)

8. a) Define strongly connected components. How DFS can be used to find strongly connected components? 5 CO4 K2  
5  
b) Find an optimal paranthesization of a matrix-chain product whose sequence of dimensions is  $4 \times 10, 10 \times 3, 3 \times 12, 12 \times 20, 20 \times 7$ .

#### UNIT-V

9. In chess, a queen can move as far as she pleases, horizontally, vertically, or diagonally. A chess board has 8 rows and 8 columns, with the challenge being to place 8 queens on it so that no two queens can attack each other in a single move. How can the N Queen's problem be solved using backtracking? Provide the pseudo-code with an example of  $N=8$  and display the output of the chessboard. 10 CO5 K3

(OR)

10. a) Define graph coloring and write an algorithm to find Hamiltonian cycles. 5 CO5 K2  
5  
b) Compare and contrast between connected components and bi connected components.

#### UNIT-VI

11. a) Explain Branch and bound technique. 5 CO6 K2  
b) How Travelling Salesperson Problem can be solved using Branch and bound. 5

(OR)

12. a) Define NP-Hard and NP-complete problems. 5 CO6 K1  
b) What do you mean by intractable problems? 5

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
<b><u>UNIT-I</u></b>				
1.	Solve the 8 puzzle problem w.r.t the problem characteristics. (OR)	10M	CO1	K3
2.	Explain about breadth first search and depth first search with an example and discuss their advantages and disadvantages	10M	CO1	K2
<b><u>UNIT-II</u></b>				
3.	Using constraint satisfaction procedure to solve the following crypt-arithmic problem. $\begin{array}{r} \text{T W O} \\ + \text{T W O} \\ \hline \text{F O U R} \end{array}$	10M	CO2	K3
<b>(OR)</b>				
4.	Discuss A* Algorithm with suitable example.	10M	CO2	K2
<b><u>UNIT-III</u></b>				
5.	Consider the following predicates and proof: a) John likes all kinds of food.   b) Apples are food. c) Chicken is food.   d) Anything any are eats and is not killed by is food.   e) Bill eats peanuts and is still alive f) Sue eats everything Bill eats. Solve 1) Translate to predicate logic 2) Prove that John likes Peanuts. 3) Convert the formulae into clause form. 4) Prove that John likes peanuts using resolution	10M	CO3	K3
<b>(OR)</b>				
6.	Explain the Unification algorithm with an example?	10M	CO3	K2
<b><u>UNIT-IV</u></b>				
7.	What do you mean by Frames? Show how frames are used for a computer department of a college.	10M	CO4	K3
<b>(OR)</b>				
8.	Describe the basic building blocks of the conceptual dependency representation.	10M	CO4	K2
<b><u>UNIT-V</u></b>				
9.	What do you mean by Planning? Explain various components of planning with suitable example?	10M	CO5	K2
<b>(OR)</b>				
10.	a) Explain Bayesian network in detail with suitable example. b) Explain Dempster-Shafer theory in detail?	5M 5M	CO5 CO5	K2 K2
<b><u>UNIT-VI</u></b>				
11.	Why we use Expert System? Explain Expert system architecture with neat diagram?	10M	CO6	K2
<b>(OR)</b>				
12.	What do you mean by Expert System shell. Discuss the various advantages and disadvantages of Expert system.	10M	CO6	K2

# AR18

**CODE: 18ECT210**

**SET-1**

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

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

**PULSE AND DIGITAL CIRCUITS  
(Electronics and Communication 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) Explain the response of RC High Pass circuit for the following input waveforms i) Step ii) Pulse 6M
- b) Prove that an RC circuit behaves as a good integrator if  $RC > 15T$ , where T is the period of an input signal. 6M

**(OR)**

2. a) What is an attenuator? How can an uncompensated attenuator be modified as a compensated attenuator? 6M
- b) The limited ramp is applied to a RC differentiator circuit. Draw the waveforms for the case, i)  $T=0.2RC$  ii)  $T=RC$  and iii)  $T=5RC$ . 6M

## UNIT-II

3. a) Explain the working of a two-level diode clipper with the help of circuit diagram, waveform and transfer characteristics. 6M
- b) Draw the basic circuit diagram of positive peak clamper circuit and explain its operation. 6M

**(OR)**

4. a) Determine the output waveform for the biased clipping circuit for the square wave input. 6M
- b) A symmetrical 50 Hz square wave whose peak-to-peak excursions are  $\pm 100$  V with respect to ground is to be negatively clamped at 25 V. Draw the necessary circuit diagram and output waveform for this purpose. 6M

## UNIT-III

5. a) Give a brief note on piece-wise linear diode characteristics. 6M
- b) What are the reasons for existence of rise time and fall time in transistor? 6M

**(OR)**

6. a) Explain the switching characteristics of Transistor? 6M
- b) A fixed bias Bi-stable multivibrator circuit uses a DC supply of  $\pm 12$  V,  $R_C=2k\Omega$ ,  $R_1=10k\Omega$  and  $R_2=47k\Omega$ . NPN silicon transistor with  $V_{CE(sat)} = 0.1$  V,  $V_{BE(sat)} = 0.7$  V and  $h_{FE}(\min)=30$  are used i. Draw the circuit diagram and show the stable state currents assuming that transistor Q1 is OFF and Q2 is ON. ii. Calculate all currents and voltages and verify the device states. 6M



#### **UNIT-IV**

7. a) Explain the need of trigger circuit in monostable multivibrator? List out types of trigger circuits? 6M
- b) Design an astable multivibrator to generate a 5kHz square wave with a duty cycle of 60% and amplitude 12V. Use NPN silicon transistors having  $h_{FE(min)} = 70$ ,  $V_{CE(sat)} = 0.3V$ ,  $V_{BE(sat)} = 0.7V$ ,  $V_{BE(cutoff)} = 0V$  and  $R_C = 2K\Omega$ . 6M
- (OR)**
8. a) Explain about free running multivibrator. 6M
- b) Explain the principle of operation monostable multivibrator and also derive the expression for pulse width (gate width). 6M

#### **UNIT-V**

9. a) Explain the working of a transistor Bootstrap sweep circuit and derive expression for the slope sweep error. 6M
- b) Why the time base generators are called sweep circuits? Give most important applications of time –base generators. 6M
- (OR)**
10. a) Explain how to cancel the pedestal in a sampling gate with suitable circuit diagram. 6M
- b) Draw the circuit diagram of a unidirectional sampling gate which delivers an output only at the coincidence of a number of control voltages and explain its working. 6M

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) Derive an expression for the electric field  $\mathbf{E}$  at any point due of an infinite line of charge. 8 M  
b) State and prove Point form of Gauss's law. 6 M  
(OR)
2. a) Define Electric Potential and obtain the relationship between  $\mathbf{E}$  and  $V$  with necessary expressions. 7 M  
b) Find the total charge in a volume defined by six planes for which  $1 \leq x \leq 2$ ,  $2 \leq y \leq 3$ ,  $3 \leq z \leq 4$  if  $\mathbf{D} = 4x \mathbf{a}_x + 3y^2 \mathbf{a}_y + 2z^3 \mathbf{a}_z$  C/m<sup>2</sup>. 7 M

### UNIT-II

3. a) Derive Poisson's and Laplace's equations using Gauss' law. 7 M  
b) Deduce the expression for continuity of current equation. 7 M  
(OR)
4. a) Derive the expression for the Capacitance of a Composite parallel plate capacitor if the Dielectric boundary is normal to the plates. 7 M  
b) The polarization within a region having  $\epsilon_r = 2.7$  has the uniform value of 7 M  
 $\mathbf{P} = -0.2 \mathbf{a}_x + 0.7 \mathbf{a}_y + 0.3 \mathbf{a}_z$   $\mu\text{C/m}^2$ . Find:  
(i)  $\mathbf{E}$  (ii)  $\mathbf{D}$  (iii) Magnitude of Voltage Gradient

### UNIT-III

5. a) State Biot- Savart's circuit law. Derive an expression for magnetic field at any point because of an infinitely long current carrying conductor. 10 M  
b) Explain Oesterd's experiment. 4 M  
(OR)
6. A steady current of 1000 A is established in a long straight, hollow aluminium conductor of inner radius 1 cm and outer radius 2 cm. Assuming uniform resistivity, calculate  $\mathbf{B}$  as a function of radius  $r$  from the axis of the conductor and plot the graph between  $\mathbf{B}$  and the radius. 14 M

#### UNIT-IV

7. a) Explain magnetic dipole and dipole moment. Obtain the expression for torque on a current loop placed in magnetic field. 10 M  
b) Distinguish between Self and Mutual inductance. 4 M
- (OR)**
8. a) A rectangular loop of wire in a free space joins point A(1,0,1) to B(3,0,1) to C(3,0,4) to D(1,0,4). The wire carries a current of 6 mA flowing in the  $\mathbf{a}_z$  direction from B to C. A filamentary current of 15 A flows along entire z-axis in the  $\mathbf{a}_z$  direction. Find the force on the loop. 8 M  
b) Calculate the inductance of 15m length of co-axial cable filled with a material for which relative permeability is 75 and the inner radius is half that of outer radius. 6 M

#### UNIT-V

9. a) With necessary explanation, express the Maxwell's equation in differential and integral forms in time- varying EM fields. 8 M  
b) Explain about Displacement current with necessary expressions. 6 M
- (OR)**
10. a) State Poynting theorem and explain its significance. 8 M  
b) For a lossy dielectric, conductivity of the material is 5 S/m and the relative permittivity is 1. The electric field intensity is  $E = 100 \sin 10^{10} t$ . Find Conduction current density and Displacement current density. 6 M