NOORUL ISLAM COLLEGE OF ENGG, KUMARACOIL.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGG.

SUBJECT NAME: Electronic and microprocessor

SUBJECT CODE: EC 1264

III semester Mechanical Engineering

Two marks questions and answers

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Unit I SEMICONDUCTOR THEORY

1. What are valence electrons?
Electron in the outer most shell of an atom is called valence electron.

2. What is forbidden energy gap?
The space between the valence and conduction band is said to be forbidden energy gap.

3. What are conductors? Give examples?
Conductors are materials in which the valence and conduction band overlap each other so there is a swift movement of electrons which leads to conduction. Ex. Copper, silver.

4. What are insulators? Give examples?
Insulators are materials in which the valence and conduction band are far away from each other. So no movement of free electrons and thus no conduction. Ex glass, plastic.

5. What are Semiconductors? Give examples?
The materials whose electrical property lies between those of conductors and insulators are known as Semiconductors. Ex germanium, silicon.

6. What are the types of Semiconductor?
1. Intrinsic semiconductor 2. Extrinsic semiconductor.

7. What is Intrinsic Semiconductor?
Pure form of semiconductors are said to be intrinsic semiconductor. Ex germanium, silicon.

8. What is Extrinsic Semiconductor?
If certain amount of impurity atom is added to intrinsic semiconductor the resulting semiconductor is Extrinsic or impure Semiconductor.

9. What are the types of Extrinsic Semiconductor?
1. P-type Semiconductor 2. N- Type Semiconductor.

10. What is P-type Semiconductor?
The Semiconductor which are obtained by introducing pentavalent impurity atom (phosphorous, antimony) are known as P-type Semiconductor.

11. What is N-type Semiconductor?
The Semiconductor which are obtained by introducing trivalent impurity atom (gallium, indium) are known as N-type Semiconductor.

12. What is doping?
Process of adding impurity to an semiconductor atom is doping. The impurity is called dopant.

13. Which is majority and minority carrier in N-type Semiconductor?
Majority carrier: electrons and minority carrier: holes.

14. Which is majority and minority carrier in P-type Semiconductor?
Majority carrier: holes and minority carrier: electrons.

15. What is depletion region in PN junction?
The diffusion of holes and electrons will result in difference in concentration across the junction which in turn results in the movement of the mobile charge

carriers to the junction thus resulting in a region called depletion region.

16. What is barrier voltage?

Because of the oppositely charged ions present on both sides of PN junction an electric potential is established across the junction even without any external voltage source which is termed as barrier potential.

17. What is meant by biasing a PN junction?

Connecting a PN junction to an external voltage source is biasing a PN junction.

18. What are the types of biasing a PN junction?

1. Forward bias 2. Reverse bias.

19. What is forward bias and reverse bias in a PN junction?

When positive of the supply is connected to P type and negative to N type then it is forward bias. When positive of the supply is connected to N type and negative to P type then it is reverse bias.

20. What is Reverse saturation current?

The current due to the minority carriers in reverse bias is said to be reverse saturation current.

21. What is reverse break down?

During reverse bias after certain reverse voltage the current through the junction increases abruptly thus breaking the crystal which is termed as reverse break down.

22. Give the diode current equation?

$I = I_0. (e^{-1})$

23. Give two applications of PN junction diode.

1. As rectifier in power supplies.
2. as switch in logic circuits

24. What is rectifier? Give its types.

Rectifier converts A.C to pulsating D.C. Types are HWR and FWR.

16 marks

25. Explain N-type and P-type semiconductor with their energy band diagram?

Maximum mark for this question: 8 marks

Definition of extrinsic semiconductor and its types (2 marks)
N-type semiconductor (3marks)
Definition
Diagram of crystalline structure and energy band (2 marks)
P-type semiconductor (3marks)
Definition
Diagram of crystalline structure and energy band (2 marks)

26. Explain the following

a. Mobility b. Drift current c. Conductivity d. Diffusion current

Maximum mark for this question: 12 marks

a. mobility - definition and relation required (2 marks)
b. Drift current – definition, diagrams and derivation of relation required (4marks)
c. Conductivity - definition and relation required (2 marks)
d. Diffusion current - definition, diagrams and derivation of relation required (4marks)

27. What is break down in diode? What are its types?

Maximum mark for this question: 6 marks

Definition of break down and explanation (2 marks)
Zener break down (2 marks)
Avalanche break down (2 marks).

Unit II TRANSISTORS

1. **What is a transistor (BJT)?**
Transistor is a three terminal device whose output current, voltage and /or power is controlled by input current.

2. **What are the terminals present in a transistor?**
Three terminals: emitter, base, collector.

3. **What is FET?**
FET is abbreviated for field effect transistor. It is a three terminal device with its output characteristics controlled by input voltage.

4. **Why FET is called voltage controlled device?**
The output characteristics of FET is controlled by its input voltage thus it is voltage controlled.

5. **What are the two main types of FET?**
1. JFET 2. MOSFET.

6. What are the terminals available in FET?
1. Drain 2. Source 3. Gate

7. **What is JFET?**
JFET- Junction field effect transistor.

8. **What are the types of JFET?**
N- channel JFET and P- Channel JFET

9. What are the two important characteristics of JFET?
1. Drain characteristics 2. Transfer characteristics.

10. **What is transconductance in JFET?**
It is the ratio of small change in drain current to he corresponding change in drain to source voltage.

11. **What is amplification factor in JFET?**
It is the ratio of small change in drain to source voltage to the corresponding change in Gate to source voltage.

12.Why do we choose q point at the center of the loadline?
The operating point of a transistor is kept fixed usually at the center of the active region in order that the input signal is well amplified. If the point is fixed in the saturation region or the cut off region the positive and negative half cycle gets clipped off respectively.

13. **List out the different types of biasing. ._**
Voltage divider bias ,Base bias,Emitter feed back bias,Collector feedback bias,Emitter bias.

14. **What do you meant by thermal runway?**
Due to the self heating at the collector junction, the collector current rises. This causes damage to the device. This phenomenon is called thermal runway.

15. Why is the transistor called a current controlled device?

The output characteristics of the transistor depend on the input current. So the transistor is called a current controlled device.

16. Define current amplification factor?

It is defined as the ratio of change in output current to the change in input current at constant.

17. What are the requirements for biasing circuits?

- The q point must be taken at the Centre of the active region of the output characteristics.
- Stabilize the collector current against the temperature variations.
- Make the q point independent of the transistor parameters.
- When the transistor is replaced, it must be of same type.

18. When does a transistor act as a switch?

The transistor acts as a switch when it is operated at either cutoff region or saturation region

19. What is biasing?

To use the transistor in any application it is necessary to provide sufficient voltage and current to operate the transistor. This is called biasing.

20. What is stability factor?

Stability factor is defined as the rate of change of collector current with respect to the rate of change of reverse saturation current.

21. Explain about the various regions in a transistor?

The three regions are active region saturation region cutoff region.

22. Explain about the characteristics of a transistor?

Input characteristics: it is drawn between input voltage & input current while keeping output voltage as constant.

Output characteristics: It is drawn between the output voltage &output current while keeping input current as constant.

16 marks

23. Explain the construction, operation, volt ampere characteristics, and application of SCR, also explain its two transistor model.

Maximum mark for this question: 16 marks

Construction (2marks)

Equivalent circuit and two transistor model (2marks)

Operation (4marks)

Volt ampere characteristics (4marks)

Application (2marks)

24. Explain the construction, operation, equivalent circuit, volt ampere characteristics, and application of UJT.

Maximum mark for this question: 16 marks

Construction (4marks)

Equivalent circuit (2marks)

Operation (4marks)
Volt ampere characteristics (4marks)
Application (2marks)

25. Explain the construction, operation, equivalent circuit, volt ampere characteristics, and application of DIAC.

Maximum mark for this question: 16 marks
Construction (4marks)
Equivalent circuit (2marks)
Operation (4marks)
Volt ampere characteristics (4marks)
Application (2marks)

26. Explain the construction, operation, equivalent circuit, volt ampere characteristics, and application of TRIAC

Maximum mark for this question: 16 marks
Construction (4marks)
Equivalent circuit (2marks)
Operation (4marks)
Volt ampere characteristics (4marks)
Application (2marks)

Unit III DIGITAL ELECTRONICS

1. Define binary logic?

Binary logic consists of binary variables and logical operations. The variables are designated by the alphabets such as A, B, C, x, y, z, etc., with each variable having only two distinct values: 1 and 0. There are three basic logic operations: AND, OR, and NOT.

2. Convert $(634)_8$ to binary

634 = 110 011 100
Ans = 110011100

3. Convert 0.640625 decimal number to its octal equivalent.

0.640625 x 8 = 5.125
0.125 x 8 = 1.0
0.640 625 10 = $(0.51)_8$

4. Convert 0.1289062 decimal number to its hex equivalent

0.1289062 x 16 = 2.0625
0.0625 x 16 = 1.0
0.1289062 = $(0.21)_{16}$

5. Substract $(0\ 1\ 0\ 1)_2$ from $(1\ 0\ 1\ 1)_2$

1 0 1 0
0 1 0 1
Answer = 0 1 1 0

6. Add $(1\ 0\ 1\ 0)_2$ and $(0\ 0\ 1\ 1)_2$

1 0 1 0
0 0 1 1
Answer = $(1\ 1\ 0\ 1)_2$

7. **Using 10's complement subtract 72532 - 3250**
M = 72532
10's complement of N = + 96750
Sum = 169282
Discard end carry
Answer = 69282

8. Find 2'S complement of $(1\ 0\ 1\ 0\ 0\ 0\ 1\ 1)_2$
0 1 0 1 1 1 0 0 1 - 1's Complement + 1
0 1 0 1 1 1 0 1 0 - 2's complement.

9. Substract $1\ 1\ 1\ 0\ 0\ 1_2$ from $1\ 0\ 1\ 0\ 1\ 1_2$ using 2' s complement method
1 0 1 0 1 1
+ 0 0 0 1 1 1 - 2' s comp. of 1 1 1 0 0 1
_____
1 1 0 0 1 0
Answer in 2' s complement form $(0\ 0\ 1\ 1\ 1\ 0)_2$

10. What is meant by bit?
A binary digit is called bit

11. Define byte?
Group of 8 bits.

12. List the different number systems?
i) Decimal Number system
ii) Binary Number system
iii) Octal Number system
iv) Hexadecimal Number system

13. What are the different types of number complements?
i) r' s Complement
ii) (r-1)' s Complement.

14. Given the two binary numbers X = 1010100 and Y = 1000011, perform the subtraction (a) X -Y and (b) Y - X using 2's complements.
a) X = 1010100
2's complement of Y = 0111101

Sum = 10010001
Discard end carry
Answer: X - Y = 0010001
b) Y = 1000011
2's complement of X = + 0101100

Sum = 1101111
There is no end carry, The MSB BIT IS 1.
Answer is Y-X = -(2's complement of 1101111) = - 0010001

15. Write the names of basic logical operators.
1. NOT / INVERT

2. AND
3. OR

16. What are basic properties of Boolean algebra?

The basic properties of Boolean algebra are commutative property, associative property and distributive property.

17. State the associative property of boolean algebra.

The associative property of Boolean algebra states that the OR ing of several variables results in the same regardless of the grouping of the variables. The associative property is stated as follows:

A+ (B+C) = (A+B) +C

18. State the commutative property of Boolean algebra.

The commutative property states that the order in which the variables are OR ed makes no difference. The commutative property is:

A+B=B+A

19. State the distributive property of Boolean algebra.

The distributive property states that AND ing several variables and OR ing the result with a single variable is equivalent to OR ing the single variable with each of the the several variables and then AND ing the sums. The distributive property is:

A+BC= (A+B) (A+C)

20. What are the classification of sequential circuits?

The sequential circuits are classified on the basis of timing of their signals into two types.They are,

1)Synchronous sequential circuit.

2)Asynchronous sequential circuit.

21. Define Flipflop.

The basic unit for storage is flipflop.A flip-flop maintains its output state either at 1 or 0 until directed by an input signal to change its state.

22. What are the different types of flip-flop?

There are various types of flipflop.Some of them are mentioned below they are,

i)RS flip-flop

ii) D flip-flop

iii)JK flip-flop

iv)T flip-flop

16 Marks

23. What is the operation of RS flip-flop?

- When R input is low and S input is high the Q output of flip-flop is set.
- When R input is high and S input is low the Q output of flip-flop is reset.
- When both the inputs R and S are low the output does not change
- When both the inputs R and S are high the output is unpredictable.

24. What is the operation of SR flip-flop?

- When R input is low and S input is high the Q output of flip-flop is set.

- When R input is high and S input is low the Q output of flip-flop is reset.
- When both the inputs R and S are low the output does not change.
- When both the inputs R and S are high the output is unpredictable.

25. **What is the operation of D flip-flop?**

In D flip-flop during the occurrence of clock pulse if D=1, the output Q is set and if D=0, the output is reset.

26. **What is the operation of JK flip-flop?**

- When K input is low and J input is high the Q output of flip-flop is set.
- When K input is high and J input is low the Q output of flip-flop is reset.
- When both the inputs K and J are low the output does not change
- When both the inputs K and J are high it is possible to set or reset

28. **What is the operation of T flip-flop?**

T flip-flop is also known as Toggle flip-flop.

- When T=0 there is no change in the output.
- When T=1 the output switch to the complement state (ie) the output toggles.

29. **What are the different types of shift type?**

There are five types. They are, ._Serial In Serial Out Shift Register ._Serial In Parallel Out Shift Register ._Parallel In Serial Out Shift Register ._Parallel In Parallel Out Shift Register ._Bidirectional Shift Register

30. **Explain couners**.

Synchronous counters

These counters use common clock pulse. It may be a up counter or down counter. It uses JK flipflop.

Asynchronous counters

There is no common clock pulse. The output of each flipflop is the clock pulse for next flipflop.It uses JK or T flipflop.

Unit IV 8085 MICROPROCESSOR

1. **Give What is microprocessor. the power supply & clock frequency of 8085**

A microprocessor is a multipurpose, programmable logic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions and provide result as output. The power supply of 8085 is +5V and clock frequency in 3MHz.

2. **What is the signal classification of 8085**

All the signals of 8085 can be classified into 6 groups

- Address bus
- Data bus
- Control and status signals

- Power supply and frequency signals
- Externally initiated signals
- Serial I/O ports

3. What are operations performed on data in 8085

The various operations performed are

- Store 8-bit data
- Perform arithmetic and logical operations
- Test for conditions
- Sequence the execution of instructions
- Store data temporarily during execution in the defined R/W memory locations called the stack

4. Steps involved to fetch a byte in 8085

The PC places the 16-bit memory address on the address bus
The control unit sends the control signal RD to enable the memory chip
The byte from the memory location is placed on the data bus
The byte is placed in the instruction decoder of the microprocessor and the task is carried out according to the instruction

5. How many interrupts does 8085 have, mention them

The 8085 has 5 interrupt signals, they are INTR, RST7.5, RST6.5, RST5.5 and TRAP

6. Basic concepts in memory interfacing

The primary function of memory interfacing is that the microprocessor should be able to read from and write into a given register of a memory chip. To perform these operations the microprocessor should

- Be able to select the chip
- Identify the register
- Enable the appropriate buffer

7. Define instruction cycle, machine cycle and T-state

Instruction cycle is defined as the time required to complete the execution of an instruction. Machine cycle is defined as the time required to complete one operation of accessing memory, I/O or acknowledging an external request. T-cycle is defined as one subdivision of the operation performed in one clock period

8. What is an instruction

An instruction is a binary pattern entered through an input device to command the microprocessor to perform that specific function

9. What is the use of ALE

The ALE is used to latch the lower order address so that it can be available in T2 and T3 and used for identifying the memory address. During T1 the ALE goes high, the latch is transparent ie, the output changes according to the input data, so the output of the latch is the lower order address. When ALE goes low the lower order address is latched until the next ALE.

10. How many machine cycles does 8085 have, mention them

The 8085 has seven machine cycles. They are

- Opcode fetch
- Memory read
- Memory write

- I/O read
- I/O write
- Interrupt acknowledge
- Bus idle

11. **Explain the signals HOLD, READY and SID**

HOLD indicates that a peripheral such as DMA controller is requesting the use of address bus, data bus and control bus. READY is used to delay the microprocessor read or write cycles until a slow responding peripheral is ready to send or accept data. SID is used to accept serial data bit by bit

12. **Mention the categories of instruction and give two examples for each category**

The instructions of 8085 can be categorized into the following five

- Data transfer MOV Rd,Rs STA 16-bit
- Arithmetic ADD R DCR M
- Logical XRI 8-bit RAR
- Branching JNZ CALL 16-bit
- Machine control HLT NOP

13. **Explain LDA, STA and DAA instructions**

LDA copies the data byte into accumulator from the memory location specified by the 16-bit address. STA copies the data byte from the accumulator in the memory location specified by 16-bit address. DAA changes the contents of the accumulator from binary to 4-bit BCD digits.

14. **Explain the different instruction formats with examples**

The instruction set is grouped into the following formats

- One byte instruction MOV C,A
- Two byte instruction MVI A,39H
- Three byte instruction JMP 2345H

15. **What is the use of addressing modes , mention the different types**

The various formats of specifying the operands are called addressing modes, it is used To access the operands or data. The different types are as follows

- Immediate addressing
- Register addressing
- Direct addressing
- Indirect addressing
- Implicit addressing

16. **Differentiate between absolute and linear select decoding?**

Absolute decoding

All higher address lines are defined to select the memory or I/O device

Linear decoding

Few higher address lines are decoded to select the memory or I/O device

17. **What is the use of bi-directional buffers**

It is used to increase the driving capacity of the data bus. The data bus of a microcomputer system is bi-directional, so it requires a buffer that allows the data to flow in both directions.

18. **Give the resister organization of 8085**

B,C,D,E,H,L,Z,W

19. Define stack and explain stack related instructions

The stack is a group of memory locations in the R/W memory that is used for the emporary storage of binary information during the execution of the program. The stack related instructions are PUSH & POP

20. Why do we use XRA A instruction

The XRA A instruction is used to clear the contents of the Accumulator and store the value 00H.

21. Define PSW

The PSW or flags are used to reflect the data conditions in the accumulator. The 8085 flags are S-Sign flag, Z-Zero flag, AC-Auxillary carry flag, P-Parity flag, CY-Carry flag.

22. What is Microcontroller and Microcomputer

Microcontroller is a device that includes microprocessor, memory and I/O signal lines On a single chip, fabricated using VLSI technology. Microcomputer is a computer that Is designed using microprocessor as its CPU. It includes microprocessor, memory and I/O.

16 marks

23. Compare CALL and PUSH instructions

CALL	PUSH
When CALL is executed the microprocessor automatically stores the 16-bit address of the instruction next to CALL on the stack	PUSH to save the contents of the register
When CALL is executed the stack pointer I is decremented by two.	When PUSH is executed the stack pointer register is decremented by two.

24. How does the microprocessor differentiate between data and instruction.

When the first m/c code of an instruction is fetched and decoded in the instruction register , the microprocessor recognizes the number of bytes required to fetch the entire instruction. For example MVI A, Data, the second byte is always considered as data. If the data byte is omitted by mistake whatever is in that memory location will be considered as data & the byte after the "data" will be treated as the next instruction.

25. Explain 8085 architecture.

- It is a program controlled device.
- It fetches, decodes and executes the instructions.
- It is a 8 bit processor. Since it has a 8 bit data bus.
- The ALU has 8 bits. All the registers are 8 bit registers.
- The address bus has 16 bits. The memory capacity is 64K bytes.
- It has a 8 bit flag register.
- The timing and control unit coordinates all the operations.

- The ALU performs all the arithmetic and logical operations.
- The address bus carries the address of memory location. The datas are carried by data bus and will be decoded and executed.

26. **Explain the instruction set.**

- Arithmetic instructions
  a)ADD
  b)SUB
  c)INR
  d)DCR
  e)ADI
  f)SUI
- Logical instructions
  a)ANA
  b)ANI
  c)ORA
  d)ORI
  e)XRA
  f)XRI
  g)RAL
  h)RLC
  i)RAR
  j)RRC
- Data transfer instructions
  a)MOV
  b)MVI
  c)PUSH
  d)POP
  e)LXI
  f)STA
  g)LDA
  h)LDAX
  i)STAX
- Branching instructions
  a)JUMP
  b)CALL
  c)RET
- Machine control instructions
  a)STC
  b)CLC
  c)HLT
  d)NOP

27. **Explain the Addressing modes**

- Register addressing mode
  MOV A,B
- Direct addressing mode

STA addr

- ❖ Indirect addressing mode
  LDAX Rp
- ❖ Implied addressing mode
  STC
- ❖ Immediate addressing mode
  MVI A,08H

Unit v INTERFACING APPLICATIONS

1. **Give few applications of 8085 microprocessor.**
   a) Used to measure and control temperature.
   b) Used to control stepper motor.
   c) Used to control traffic light system
   d) Used to control speed of DC motor.
2. **List the advantages of microprocessor based system design.**
   a) It simplifies system design.
   b) It reduces size and cost
   c) It is flexible in operation
3. **What is a Buffer?**
   It is storage device. It can store a bit. It has one input and output.
4. **What is a tristate buffer?**
   It is a buffer, which has one input line, one output line and an enable line. When enable line is low it acts as a buffer, otherwise it acts as a high impedance state.
5. **What is meant by memory address space?**
   Memory address space is the maximum possible memory size which can be used in a microprocessor.
6. **If an information flows from memory to microprocessor, which signal is used by it?**

   $\overline{RD}$
7. **What is the use CS pin of a memory chip?**
   A chip select is used to enable the memory chip.
8. **If the starting address of 6K memory is 0D00, then ending address will be**
   24FF H
9. **If an information flows to memory, which signal is used by it?**

   $\overline{WR}$
10. **What is memory mapping?**
    The assignment of memory addresses to various registers in a memory chip is called memory mapping.
11. **What is I/O mapping?**
    The assignment of addresses to various I/O devices in a memory chip is called I/O mapping.

12. **What is memory mapped I/O?**
    The microprocessor assigns 19 bit address to I/O device. The memory map is shared between memory and I/O.
13. **What is I/O mapped I/O?**
    The I/O devices have separate addresses. The microprocessor assigns 8 bit address to I/O devices.
14. **Mention the advantages of memory mapped I/O.**
    Arithmetic or logical operations can be directly performed directly with I/O data.
15. **Mention the advantages of I/O mapped I/O.**
    Whole address space is available for memory device and less hardware is required.
16. **Mention the disadvantages of I/O mapped I/O.**
    Arithmetic and logical operation cannot be directly used with I/O data.
17. **What is the use of ALE signal?**
    It is used to demultiplex address and data bus.
18. **What is the purpose IO/$\overline{M}$ signal?**
    It is used to differentiate memory and IO operations. When 1 means IO operation, 0 means memory operation.
19. **Nane the two classifications of stepper motor.**
    Permanent magnet type and variable reluctant type.
20. **List the applications of stepper motor.**
    Used in printers, robot alarms, X-Y plotter.

16 marks

21. **Explain I/O interfacing.**
    Input interfacing
    Key boards can be used.
    It uses IN instruction
    3-to-8 decoder is used to decode the address.
    Output interfacing
    LEDs are used
    Uses OUT instruction
    3-to-8 decoder is used to decode the address.
22. **Explain stepper motor interfacing.**
    1. Initialise PPI port A as output port.
    2. Store switching sequence in memory.
    3. Set the counter.
    4. Send first data to stepper motor through port A.
    5. Call delay.
    6. Repeat 4 to 5 till the count is 0.
    7. Repeat 2 to 6 fot continous rotation.
23. **Explain traffic light control.**
    1. initialize all ports oi 8255 as output port.
    2. store the sequence in memory.

3. Set the counter.
4. Send first data to port A, second to port B, third to port C.
5. Call delay.
6. Repeat 2 to 6 for continuous control.

24. Explain temperature control using 8085.

1. Initialise 8255 ports.
2. Send SOC to A/D converter.
3. Check EOC from A/D converter.
4. Read data from A/D converter.
5. Store the temperature in memory.
6. Compare the output of A/D converter with desired value.
7. Display the temperature.
8. Repeat 2 to 7 for continuous measurememt.