DIGITAL ELECTRONICS

F.Y. B. Sc.(Comp. Sci.)

QUESTION BANK

UNIT - I

Data Representation and Arithmetic for Computers

Q. 1. Convert the following decimal number into:
$(89)_{10} = (?)_{16} = (?)_8 = (?)_2$

Q. 2. Convert the decimal $_{number}$ $(128)_{10}$ into binary, octal, hexadecimal number system.

Q. 3. Convert decimal number 125.85 into its binary equivalent

Q. 4. What is the decimal equivalent of binary number 10110.010 ?

Q. 5. In two's complement method of subtraction, what indicates the polarity of result ?

Q. 6. convert the following octal numbers into binary equivalent 563.213, 24.76.

Q. 7. Convert the given decimal number into binary number : $(37)_{10}$

Q. 8. Describe Hexadecimal and octal number system in detail . How can decimal numbers be converted to hexadecimal and octal numbers ?

Q. 9. Convert 2479 to hexadecimal.

Q. 10. Perform the following subtraction using 2's complement method, and interprete the result.
$(27)_{10} - (32)_{10}$

Q. 11. Give the radix or base of the following number systems :
1. Binary 2. Decimal 3. Octal 4. Hexadecimal

Q. 12. convert the following numbers :
1. $(35)_{10} = (?)_{16}$
2. $(48)_8 = (?)_{10}$

Q13. Convert the following numbers
$(89)_{10} = (?)_2 = (?)_{Gray}$

Q. 14. Solve using 2's complement method :
1. $(1101)_2 - (011)_2$
2. $(1100)_2 - (1111)_2$

Q.15. Construct the Hamming code for the data 11110011. with even parity Write the limitations of hamming code.

Q. 16. Construct a BCD and Excess 3 code for decimal number 0 to 9.

Q. 17. Convert the decimal number $(128)_{10}$ into binary, Gray and Excess-3 number systems.

Q. 18. A receiver received the following Hamming code 01010101011 with odd parity . Find the error in the received code and give the corrected data.

Q. 19. Construct the BCD and Gray code for decimal number 0 to 9 .

Q. 20. 1101 is not a BCD number. justify.

Q. 21. Write a short note on weighted and unweighted codes with two examples each.

Q. 22. Gray code is not used for performing arithmetic operations , Why ?

Q. 23. Convert binary 1001 to its gray equivalent and gray 0110 to its binary equivalent .

Q. 24. Construct Hamming code for data 110010111 with even parity.

Q. 25.Convert the following binary numbers into gray code.

i. 01011
ii. 11010

Q. 26. Describe the BCD CODE and ASCII code

Q. 27. A receiver receives the Hamming code 101101010 with odd parity. Find the error in the received code and give the corrected data.

Q. 28. What is ASCII code? Where is it used ?

Q. 29. Write a short note on Gray code.

Q.30. Explain the weighted and nonweighted codes with suitable examples.

Q.31. Construct Hamming code for data 11110011 with even parity .

Q. 32. What is ASCII code ? Where it is used?

Q. 33. What do you mean by Weighted code and Non-weighted code ? Give example of each for decimal 7.

Q. 34. Why is it necessary to use Hamming code? Generate hamming code for data 10110 with odd parity.

Q. 35. What is the difference between BCD and Binary Code ? Give the BCD and Binary Equivalent for $(15)_{10.}$

Q.36. What is the parity ? What is the use of Parity Bit ? With suitable example explain how Hamming code can be designed for error detection and correction

Q.37. Convert the following into gray code.

1. $(23)_8$ 2. $(23)_{10}$

Q. 38. What is parity code ? How is error detected with it? What is its limitations ?

Q. 39. Obtain Hamming code of 1101 using odd parity . During transmission of this code, if error occurs in MSB, how is it detected ?

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UNIT 2: Logic Gates

Q.1. Build NAND, EXOR gates using only NOR gates .

Q.2. Simplify the following equation using k-map

$Y = \bar{A}\,B\,\bar{C}\,D + A\,B\,\bar{C}\,\bar{D} + A\,\bar{B}\,\bar{C}\,\bar{D} + A\,\bar{B}\,C\,D + A\,B\,C\,\bar{D} + A\,B\,C\,\bar{D}$.
Draw simplified logical diagram.

Q. 3. Compare the TT L and MOS logic families with their parameters.

Q.5. Build OR and EXOR gates using only NAND gates

Q.6. Write short note on k map

Q.7. Draw the circuit diagram of 2 input NAND gate using TTL logic and explain its working .

Q.9. State and prove De Morgan's theorems.

Q.10. What are Universal gates ? Construct AND and XOR gates using NOR gates.

Q. 11. Prove A+ AB = A+B using Boolean Algebra.

Q.12. Reduce the following expression using K- map and draw a simplified diagram:

$Y = \bar{A}\,\bar{B}\,\bar{C}\,\bar{D} + A\,B\,\bar{C}\,D + AB\,\bar{C}\,\bar{D} + A\,\bar{B}\,\bar{C}\,D + A\,\bar{B}\,C\,\bar{D} + A\,B\,C\,D + A\,\bar{B}\,C\,D$

Q.13. What is positive and negative logic ? Explain working of 2– input positive logic 'OR' gate using a diode circuit.

Q.14. Give symbol , Boolean expression , gate diagram and truth table of XOR gate .

Q.15. Simplify the following expression using Karnaugh's map

$Y = A\,\bar{B}\,\bar{C} + A\,\bar{B}C + A\bar{B}\,\bar{C} + A\,B\,C + A\,\bar{B}\,C + A\bar{B}C$

Q.16. Draw the diagrams for building the following gates using NOR gates :
i. OR
ii. X-OR
iii. AND
iv. NOT

Q.17. Draw the logic circuit diagram to realize the following output :

$Y = BC + B\,\bar{C}\,A$

Q.18. How can NOR gate be used to construct OR, AND and NAND gates ?

Q.19. What is Karnaugh map ? Give the layout of four variable K-map . Simplify the following Boolean equation using K-map.

$$Y = \bar{A}\,BC\bar{D} + A\bar{B}\,\bar{C}\,\bar{D} + AB\,\bar{C}\,\bar{D} + AB\bar{C}D + A\bar{B}\bar{C}D + A\,B\,C\,\bar{D} + A\,B\,\bar{C}D + \bar{A}\,B\,C\,D$$

Q.20. Draw a circuit symbol for :

i) NAND gate

ii) OR gate

Q.21. Give the statement of De-Morgan's theorem.

Q.22. Build basic gates AND , NOT, OR using NOR gate.

Q.25. Simplify the following expression using Boolean algebra :

$Y = (A+B).\ (C+D)$

Q.26. Give symbol, Boolean equation and truth table for – NAND, AND gates .

Q.28. A digital system has 4-bit input from 0000 to 1111. Design a logic circuit that produces high output when input is less than 1000. Use K-map technique.

Q. 30. State and prove De Morgan's theorems.

Q.31. Give symbol, Boolean equation and truth table for following logic gate :

1. Ex-OR
2. NOR

Q. 32.What is Karnaugh map ? Give the structure of two, three and four variable K-map. How a quad eliminates two variables ?

Q.33. A digital system has a 4 bit input from 0000 to 1111. Design a logic circuit that produces high output whenever the input is greater than 1101 . Use K-map technique.

Q. 35. State De' Morgan's Theorem.

Q.37. How can the basic gates be obtained using only NAND and only NOR gates ?

UNIT 3: Combinational Circuits

Q.1. Explain working of full adder circuit with its logic diagram and truth table .

Q.2. With the neat logic diagram explain the working of 4 bit parallel adder.

Q. 3. Explain the working of full adder circuit with its logic diagram & truth table.

Q.4. Draw the diagram of a 4 bit adder subtractor and explain its working.

Q. 5. Draw the diagram of 4 bit universal adder subtractor and explain its working.

Q. 6. Explain with a neat diagram working of a 4 –bit universal adder- subtractor circuit.

Q. 7. Draw the circuit diagram of full adder and explain it with the help of truth table .

Q. 8. With the help of suitable table diagram explain the working of 8-bit parallel adder/ subtractor .

Q. 9. Describe half adder with the help of the logic diagram and truth table.

Q.10. With the help of suitable diagram explain the working of 8-bit parallel adder / subtractor .

Q. 11. With suitable logic diagram , explain half subtractor and give its truth table.

Q. 12. Explain 4-bit binary adder/subtractor .

Q. 1 . What is multiplexer ? Draw circuit diagram of 8 : 1 multiplexer. explain its working in brief.

Q.2. write short note on IC 74148.

Q. 3. Explain decoder 7447 with its truth table and write downthe function of each pin.

Q. 4. what is multiplexer ? Draw the circuit for a 2 : 1 nibble multiplexer and explain in brief its working

Q. 5. Explain action of demultiplexer with IC 74154.
What is difference between demultiplexer and decoder ?

Q.6. With neat logic diagram explain the working of an Octal to binary Encoder.

Q. 7. Explain BCD to seven segment decoder driver.

Q. 8. Write functions of the following ICs :
7447, 74138, 74150, 74154.

Q. 9. What is a nibble multiplexer ?

Q.10. What is multiplexer ? Explain function of a 4 : 1 multiplexer with logic diagram.

Q. 11. explain decoder IC 7447with its truth table and write functions of its pins.

Q. 12. IC 7447is_____

Q. 13. what is demultiplexer ? Explain working of a 1:4 demultiplexer with logic diagram.

Q. 14 Explain the working of an octal to binary encoder. What is a priority encoder ?

Q.15. Write a short note on 7 segment display. Mention the two ICs used for driving 7 segment displays using a BCD input.

Q.16. Identify the function of the following IC's :
i. IC 74150
ii. IC74148

Q. 17. What is multiplexer ? Draw a circuit diagram of 4:1 multiplexer and explain

Q.18. What do you mean by multiplexer tree ? How will you construct 32:1 Multiplexer using 16:1 multiplexer.

Q.19. what is the difference between demultiplexer and decoder ? Write a short note on IC 7447.

Q.20. Identify the following ICs :
i. IC 74154
ii. IC 74138

Q. 21. Define multiplexing.

Q.22. What is decoder ? What is the importance of IC 7447?

Q.23 With the suitable circuit diagram explain the working of nibble multiplexer. How will you extend the circuit for byte multiplexer ?

Q.24. What is the difference between demultiplexer and decoder ?

Q. 25. Explain how a 16 : 1 multiplexer can be built using 8:1 multiplexer units.

Q.26. Draw the logic circuit of 1-8 de-multiplexer and explain how it works . How one can use this circuit as a 3to 8 decoder ?

Q.27. Identify the function of following IC's :
1. 74150 2. 74138 3. 74154 4. 7448

Q. 28. What is Encoding ? With logic diagram explain the working of decimal of binary encoder

Q. 29. What is IC 7447 ? Give the function of following pins:
1. LT and 2. RBI.

Q.30. what do you mean by multiplexing ? Design a 32: 1 Multiplexer using two 16 : 1 Multiplexers.

Q.31. What is the difference between Demultiplexer and decoder ? Give the function of ICs.
1. IC 7486 2. IC 7400 3. IC 74148 4. IC 74138.

UNIT 4: Sequential circuits

1. Explain the working of JK flip flop . How can you convert the flipflop into D flipflop?
2. Write a note on IC 7475.
3. Define
    a. clock
    b. Positive edge trigger
    c. Negative edge trigger
    d. Clear
    e. Preset
4. What is flip flop ? Explain R-S flipflop using NAND gates.
5. What is race around condition in JK flipfkop ? Explain how it is avoided in JK master slave FF.
6. "RS flip-flop cannot be converted to T flip-flop but JK flip-flop can be converted to T flip-flop". Justify this statement.
7. What is the race around condition in J-K flip-flop ? Explain how it is avoided master-slave arrangement.
8. For a T flip flop Tout =_____xT code'
9. What is the difference between asynchronous sequential circuits ? Explain the working of clocked RS flip- flop.
10. What is flip-flop ? What are the different types of flip-flops?
11. What is the relation between Clock Pulse Width and Propagation Delay Time when race around condition occurs in JK flip-flop?
12. Explain working of JK flip-flop with logic diagram and truth table . What is " Race – around Condition"? How it can be avoided ?
13. What are T and D types of flip flops ?
14. Draw the logic diagram of clocked RS flip flop and explain its working.
15. Draw the logic diagram of clocked RS flip flop using NAND gates.
16. Explain D flop flip with proper logic digram .

17. What are the types of shift register ? Explain PISO shift register in detail.
18. Explain with neat diagram 3 bit parallel in serial out shift register .
19. Explain how IC 7495 is used in left shift and right shift operation.

name the different operations that can be carried with shift register . Draw block diagrams of each. Which is the fastest operation and why ? Write down the number of 4 bit universal shift register integrated circuit.

20. How much time will be required to parallely load and serially shift a 4 bit data in a shift register operating at a d clock frequency 1 MHz ?
21. Explain the action of 4-bit parallel in serial out shift register with suitable circuit diagram. Mention the number of universal 4-bit shift register IC.
22. State various types of shift registers.
23. Draw a circuit diagram of 3-bit parallel-in serial-out shift register and explain its working.
24. What are the four modes of Shift Register? Which is fastest of them ? Why?

25. Draw the timming diagram for loading the data 1010 using SIPO mode of shift register .
26. What is a register ? Explain 4-bit serial in serial out shift register.

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27. Draw the internal block diagram of IC 7490 and explain the function of R_{01}, R_{02}, R_{91}, R_{92}
28. Explain working of 4 bit negative edge triggered asynchronous counter.
29. Explain the action of IC 7490 in MOD 7with timing diagram.
30. Explain the working of 4 bit ripple counter with the help of circuit and timing dia gram .
31. What is a counter ? what are the two important types of counters? Explain the working of a 3-bit counter of any one type with suitable diagram and input –output wave forms.
32. Give internal block diagram of 3-bit asynchronous up-down counter and explain its working.
33. Draw neat diagram of 3-bit asynchronous up-down counter and explain its working .
34. What is the difference between synchronous and asynchronous counters ? Explain how MOD -7 operation is carried out using IC 7490.
35. How many flip flops will be required to build the following counters :
    i. Mod 19 ii. Mod 6
36. With the help of suitable diagram explain the working of 3-bit up- down counter 37. Differentiate between synchronous counters, Explain the working of 3-bit synchronous counter using circuit diagram and timing diagram.
38. With the help of logic diagram, truth table and timing waveforms, explain how IC 7490 works in binary decade counter mode.
39. Explain the working of a 3-bit Ripple counter wit h timing diagrams.
40. With the help of internal block diagram of IC 7490 , explain how it works as a 'MOD-8' counter.
41. Give the difference between Synchronous and Asynchronous counter.
42. With the help of internal block diagram of IC 7490, explain how it works as a decade counter.
43. Draw a diagram of 4-bit asynchronous up-down counter. Explain its working with the help of timing diagrams.
44. Explain working of IC 7490 as a decade counter along with timing diagram.
45. Explain 4bit asynchronous down counter with truth table and timing diagram.

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UNIT 5: Multivibrator

1. Write the formula for output frequency of astable multivibrator made using IC 555.
2. What is piezoelectric effect ? what is use of piezoelectric crystals?
3. Draw the circuit diagram for crystal oscillator using invertors. What is the advantage of using a crystal in the oscillator?
4. Differentiate between a retriggerable and non –retriggerable monostable multivibrators ?
5. Quasistable periom may be extended in _____
6. What is multivibrator ? Draw input , output waveforms of bistable and monostable multiviabrators .
7. Draw circuit diagram for crystal oscillator using inverters. What is the roll of crystal in it ?
8. Give any two applications of monostable multivibrator.
9. What is the difference between bistable multivibrator and monostable multiviabrator
   Draw the circuit diagram of monostable multivibrator using IC 555.
10. Draw the circuit diagram of crystal oscillator using inverters and explane its working .
11. Draw the block diagram of IC 555. Using IC 555, draw a circuit of astable multivibrator. Derive the expressions for its output frequency.
12. Define monostable multivibrator.
13. Draw the circuit diagram of astable multivibrator using IC 555. Explain its working and show the output waveforms.
14. Draw a block diagram of IC 555 And explain the function the function of each block . Using of IC 555, draw the circuit diagram of monostable multivibrator.
15. Draw timing diagram for retriggerable monostable multivibrator with stable state ‘O’.
16. Draw circuit diagram for Crystal oscillator . Write fomula for ita frequency.
17. Draw the internal block diagram of IC 555 and explain how it works as monostable multivibrator . write formula for its quasi –stable state time .
18. Calcu;ate the output frequency of an astable multivibrator with RA = 288 Ω,RB =576 Ω and CT = 0.01 uF.
19. What are the advantages of Crystal oscillator ?
20. Draw the circuit diagram of monostable multivibrator using IC 555. Write formula for its quasi stablestate duration.
21. Draw the internal block diagram of IC 555. Explain how it works as an astable multivibrator .
22. Draw the expected output waveform of crystal, oscillator using inverters, if resonant frequency of crystal is 1 MHZ.
23. Draw the monostable multivibrator using IC 555.
24. What is piezoelectric effect ? Explain with circuit diagram how is it used to generate clock pulses ?
25. Draw the functional block diagram of IC 555. Explain its different blocks . How can it be used to design astable multivibrator ?

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UNIT 6: Memory devices and memory Organization

1. Explain difference between static RAM & dynamic RAM ?
2. Write a brief note on memory device .
   i. RAM ii .ROM iii. EPROM iv. UVPROM
3. Explain the difference between ROM and EPROM .
4. Write a short note on diode matrix ROM.
5. Clculate the number of address and data lines of the following types of ICs
   i. 256 x 8 ii. 16K X 8 iii. 2k x 4 iv. 256Kx 4 v. 512 x 8
6. What do you mean by memory refreshing ? For which type of memory it is required ?
7. What do you meant by volatile memory ?
8. Differentiate between RAM and ROM . What are the different types of ROM ?
9. How many memory chip will be required to construct
   i. 23 K bytes of memory with basic chip of 4 K x 8 ?
   ii. 64 K bytes of memory with basic chip of 16 K x 8 ?
10. Define speed and capacity of memory .
11. Give full forms of SRAM & DRAM.

Multiple choice questions

1. In one static RAM cell …….MOSFET's are used for construction (c)
   a) seven b) fourc) six d) None of these.
2. ……memory data read many times but write one times. (b)
   a) RAM b) ROM c) DRAM d) None of these.
3. ……multivibrator also called one shot multivibrator . (a)
   a) monostable b) Bistable c) Astable d) None of these.
4. ……state is temporary state of multiviabrator . (a)
   a) Quasi b) ON c) OFF d) None of these.
5. For 2kbyte memory chip the address bus is …… bits. (a)
   a) 11 b) 10 c) 12 d) None of these.
6. Odd man out (d)
   a)PROM b) EPROM c) EEPROM d) SRAM

True and False

1. Semiconductor memories are widely used for storing digital information.
2. ROM is volatile memory .
3. DRAM required refreshing
4. A 32k X4 memory to be constructed by 5 chips of 8k X 4 basic chips.

UNIT 7: Data Converters

1.Define following parameter of ADC :

a. Resolution
b. Conversion
c. accuracy
d. Monotonicity
e. Linearity.

2 . Explain 4 bit R-2R ladder and writ equation for output analog voltage.

3. Draw the circuit diagram for 2bit flash ADC and explain its working . Write the limitation for it .

4. How many bits are required to build R-2R DAC if reference voltage is + 10V and DAC has resolution of 1mV, 100 mV ? How is full – scale output dependent on resolution ?

5. A a 5 bit R-2R ladder network with 0 = 0V and 1 = 10V Find :
   a. Analog output due to LSB change
   b. Full scale output voltage
   c. Analog output for digital input 1 1 0 0 0.
6. Explain any five parameters of ADC .
7. Explain what are the different methods of DAC. Which conversion method is more suitable ? why ?
8. What is mean by ADC ? Explain tracking type ADC.
9. Explain with suitable analysis , how R-2R network functions as a DAC, in case of 4-bit data input (Analyse for input = 1000 and 0001). For a 4-bit DAC with Verf = 20 V , find full scale output and the contribution due to LSB. Define " Accuracy" and " Rsolution" of a DAC.
10. Draw the circuit diagram, for 3-bit flash ADC and explain

UNIT 8: Processors and Machine language for computer

1. **What are the different types of micro computers ?**
2. **Write a short note on desktop computers , Laptops and supercomputers.**
3. **Mention important features of Supercomputers.**
4. **Write important features of supercomputers .**
5. **Write a short note on embedded computers. What are the advantages of an embedded system ?**
6. **Write full forms of : ARV , RISC, CISC , SIMD, & PIC.**
7. **Write short note on different softwares used in program execution .**
8. **Compare Assembly Level Language and Machine Level Language .**
9. **Write important features of RISE AND CISE.**
10. **Mention important features of a Laptop .**
11. **What are the different subtypes of aPIC microcontrollers ?**
12. **Mention the differents phases involved during compilation of a program.**
13. **Compare on at least three parameters the different microcontrollers from Intel family .**
14. **Name any four microprocessor and microcontroller manufactures.**
15. **Mention important features of ARM, ARV, SIMD.**
16. **Name the processors which are manufactured by intel .**
17. **Compare 80386 and Pentium on basis of data bus , address bus, cache and math coprocessor.**
18. **Compare all the microprocessors of the Intel family .**
19. **Write a short note on 8086 processor .**

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