

**Bachelor of Engineering in Electronics and Telecommunication Engineering Examination , 2019**  
**(2<sup>nd</sup> Year , 2<sup>nd</sup> Semester )**  
**Digital Circuits and systems.**

Time: Three Hours

Full Marks: 100

Answer all questions

Q1. Define a synchronous sequential circuit and give one example. What are Moore and Mealy machines? How are they different from each other? Explain with example conversion of Mealy machine into Moore machine. Why are they called Finite State Machines (FSM)? Design a serial full adder.

(3+5+5+1+6=20)

OR

Q1 OR). (a) Discuss the steps involved in the design of an SSLC. Illustrate your explanation by using a suitable example.

(b) Why are synchronous sequential machines called deterministic machines? Define a synchronous detector and give an example. Distinguish between forbidden and don't care condition in digital circuit. Give examples.

(10+10=20)

Q2. (a) What do you mean by ASLC? Give its classification and write the differences among them in tabular form. Explain the following terms: (i) Input States, (ii) Internal States, (iii) Excitation Variables and (iv) Stable State.

(b) Explain the following statements:

(i) " There is no specific advantage of using ASLCs over SSLCs "

(ii) " The reduction of the truth table of an incompletely specified machine is a trial-and-repeat process "

(11+9=20)

OR

Q2 OR). (a) What are cycles and races? Give the differences between them. Explain critical and non-critical races with suitable examples.

(b) Explain with one suitable example the steps in synchronizing as ASLC. (10+10=20)

Q3. (a) What do you mean by hazards in digital circuits and explain the causes of hazards.

(b) Describe with example and diagram (if needed) the following: (i) static-1 and -0 hazards,

(ii) Dynamic logic hazard and (iii) function hazards.

(c) Discuss the Boolean difference method with suitable examples? What are the properties of Boolean differences? Establish them.

(d) Explain RTL and HPL. Give one example for HPL. (3+7+6+4=20)

OR

Q3 OR. (a) What are different fault-detection methods. Apply one of them and detect the fault in the given circuit

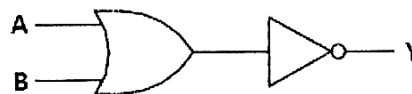


Fig 1

(b) Explain why astable multivibrator is called relaxation oscillator?. Distinguish between non-retriggerable and retriggerable monostable multivibrator. Give one example for each.

(c) Use 74123 to construct an astable multivibrator to produce a frequency of 1KHz.

(d) Describe the structures of 74121 and 74122 IC. (7+5+4+4)

[ Turn over

- Q.4. (a) Why do we need IEEE 754 standard? Take a decimal number and convert it to IEEE 754 standard.  
 (b) Explain conventional multiplication scheme with one example. State and explain Booth's multiplication algorithm. What are the advantages of this algorithm which are not available in the conventional method? Give one example to evaluate its fastness.  
 (c) Multiply the two numbers  $a_2a_1(A)$  and  $b_2b_1(B)$  and realize its hardware. (4+13+3=20)

OR

- Q4 OR. (a) Explain integer division algorithms (both restoring and non restoring) with an example for each. Show the flow charts and explanation for both the algorithms and with proper reasoning establish which one is better. Design hardware controller to implement the above scheme?  
 (b) Two 4 bit unsigned numbers are to be multiplied using the principle of carry save adder. Assume the numbers to be  $A_3A_2A_1A_0$  and  $B_3B_2B_1B_0$ . Show the arrangement and interconnection of the adders and the input signals as to generate an 8 bit product as  $P_7P_6P_5P_4P_3P_2P_1P_0$ .

(13+7=20)

- Q.5. Why do we need memory in digital computer? Give the names of all types of memory with a brief explanation of each. Give a table showing the differences among them. 20

OR

- Q5 OR. What is the main reason for not having a large enough main memory for storing the totality of information in a computer system?  
 (b) Explain the need for auxiliary memory devices. How are they different from main memory and other peripheral devices?  
 (c) List the differences and similarities between static and dynamic memory.  
 (d) Explain virtual and compact Disk types of memory.  
 (e) Draw a single transistor based dynamic memory and explain reading and writing of '1' and '0' in it .

(2+4+4+6+4=20)