

N.B. : (1) Question No. 1 is **Compulsory**.

(2) Attempt any **three** questions out of **remaining five**.

(3) Each question carries 20 marks and sub-question carry equal marks.

(4) Assume suitable data if required.

1. (a) Write the differences between signal and variable. (5)
- (b) Explain the concept of Bad clocking and Good clocking. (5)
- (c) Draw a state diagram for overlapping sequence detector for the serial sequence "11011". Use Mealy model. (5)
- (d) Explain various data types in VHDL. (5)
2. (a) Write a VHDL code for 4 bit carry look ahead adder. (10)
- (b) Using the Data / controller partition method, draw ASM charts for shift and ADD multiplier and explain it in detail. (10)
3. (a) Using WITH / SELECT / WHEN write a VHDL code for 16:1 multiplexer. (10)
- (b) Draw state diagram for BCD counter and write a VHDL code for it. (10)
4. (a) Identify the redundant states, if any for the following state diagram (shown in Figure 1) of a sequential machine and design it using JK flip-flops. (10)

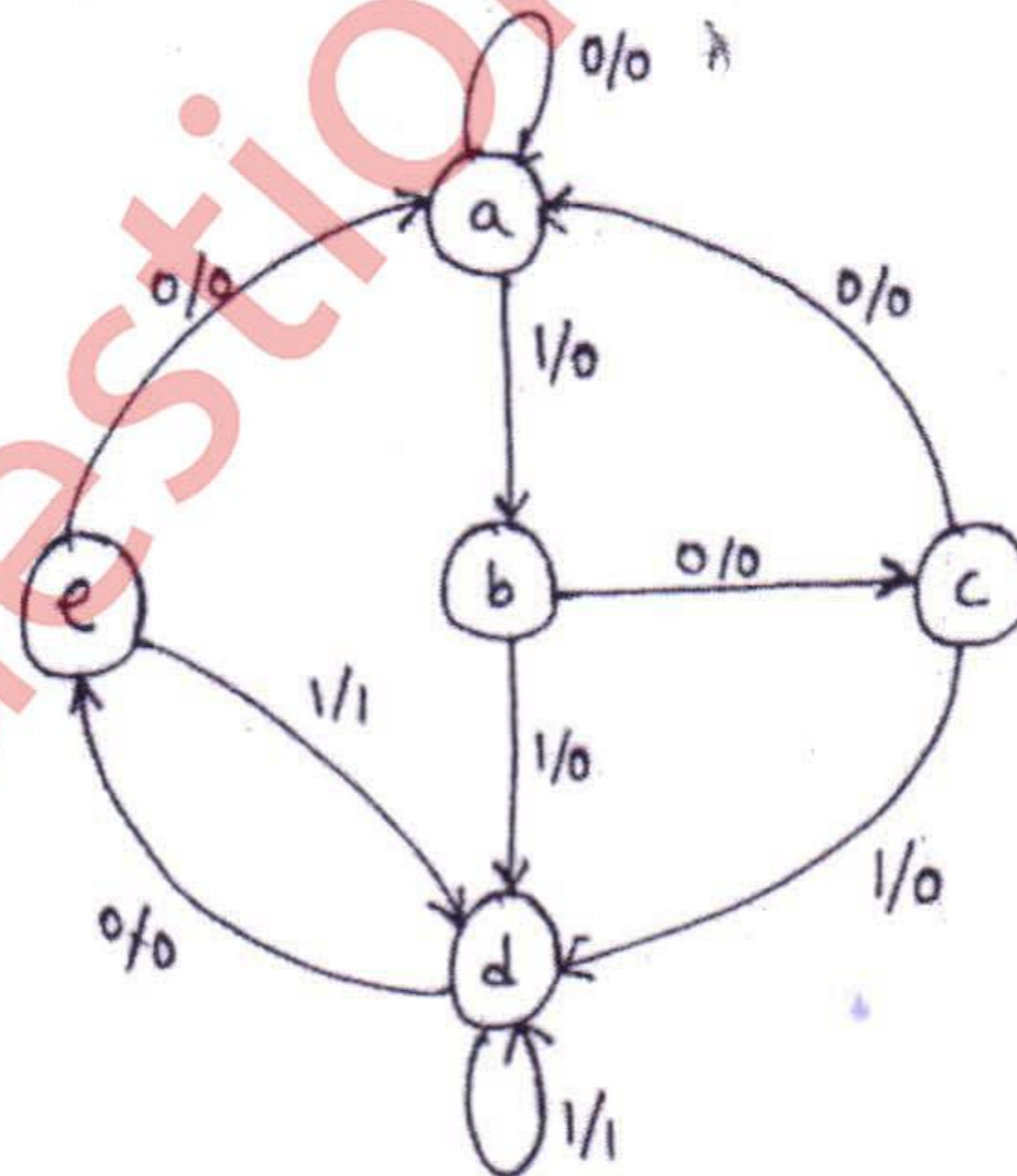


Figure 1.

- (b) Explain operation of 4 bit parallel multiplier with neat diagram. (10)
5. Write short notes on any three of the following: (20)
- (a) Divider using VHDL.
- (b) RTL simulator.
- (c) Clock management in FPGA.
- (d) Odd parity checker for serial data.
6. Design a Traffic Light Controller (TLC) having operational characteristics summarized in the following table. Use VHDL code. (This is simple TLC table which shows R or G or Y in two directions only. State RG means in one direction Red signal and other direction Green signal). (20)

State	Operation Mode		
	Regular Time	Test Time	Stand by Time
RG	60 sec	1 sec	-----
RY	05 sec	1 sec	-----
GR	50 sec	1 sec	-----
YR	05 sec	1 sec	-----
YY	-----	-----	Indefinite

Assume that a 50 Hz clock is available. The TLC has following 3 modes of operation.

- (i) Regular mode: Four states each with an independent time as shown in table, passed to the circuit by means of a constant.
- (ii) Test mode: In this, all preprogrammed times are overwritten with 1 sec.
- (iii) Standby mode: In this, in both directions yellow lights will be activated.