

Time: 3 Hours

Marks: 80

Note:- Question no. 1 is compulsory.  
 Answer any three out of remaining questions.  
 Figures to right indicates full marks.  
 Assume suitable data wherever necessary.

Q.1. Answer **any four**

(20)

- Explain following instructions of 8051 microcontroller with example.
  - MOVX
  - CJNE
  - JB
  - AJMP
  - SWAP
- Draw and explain the PSW register of 8051 microcontroller.
- Compare RISC and CISC architectures.
- Draw interfacing diagram of 8051 microcontroller and DC motor. Explain the logic to rotate motor in clockwise and counter clockwise direction.
- Draw APSR for ARM Cortex M3 and explain.

Q.2. a) Draw and Explain the port structure of 8051 microcontroller.

(10)

- Using CJNE instruction write a program to find how many positive numbers and negative numbers are there in an array from location 030H to 03AH?

(10)

Q.3. a) Draw and explain the internal RAM memory structure of 8051 microcontroller.

Write an assembly language program to perform read and write to the internal RAM.

(10)

- Discuss NVIC and MPU of ARM Cortex M3 processor.

(10)

Q.4. a) Interface temperature sensor LM35 with 8051 microcontroller and write assembly language program to display the temperature (2 digit) on 7 segment display.

(10)

- Explain operation modes and states of ARM Cortex M3 processor with suitable diagram.

(10)

Q.5. a) Design a scheme using 8051 to accept input from 4 x 4 keyboard and display the key number on the LCD display. Write program using assembly language for the same.

(10)

- Explain interrupt structure of 8051 with suitable diagram. Hence explain all SFRs associated with interrupt.

(10)

Q.6. a) Draw and interfacing diagram of 8051 microcontroller with DAC and write an assembly language program to generate triangular waveform.

(10)

- Discuss 8051 Timer SFRs and write a program in assembly language to generate delay of 10msec. Show required calculations for the same. (Crystal = 11.0592MHz)

(10)

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(3 Hours)

[Total Marks: 80]

- N. B. : (1) Question No. 1 is compulsory.  
 (2) Attempt any three out of remaining.  
 (3) Assume suitable data wherever required.

Q.1 Solve the following (Any four) 20

- A. Explain the usage of Modport in System Verilog Interface.  
 B. Differentiate between Blocking and Non blocking assignments in Verilog with proper example.  
 C. What is verification or test plan. Write the test plan for ALU design.  
 D. Differentiate directed testing and random testing concepts.  
 E. What are the advantages of OOP in System Verilog?

Q.2 A. Highlight the 4 modelling styles used in Verilog. Write Verilog code for full adder using two half adders. 10  
 B. 10

- i. Declare Dynamic array. Allocate 5 elements. Print out its size.  
 ii. Declare a Queue and initialize it with 5 string element. Insert new element @position 2.  
 iii. Is Logic datatype in SV 2-state or 4- state? How it is different than wire.  
 iv. Create Enumerated data type for all rainbow colours.  
 v. Declare 2D array. Display each & every element of it using **foreach**.

Q.3 A. Draw the layered test bench diagram and explain each of blocks stating its functionality. 10  
 B. Create a class called TE\_semV that contains the following members: 10

- 3-bit roll\_no of logic type  
 student\_name of string type  
 4-bit address of logic type  
 A void function that prints out the value of roll\_no, name and address
- i. Initialize address to 4'hF in the 1st object, passing arguments by name  
 ii. Initialize roll\_no to 3 and name to Sumanto in the 2nd object, passing arguments by name.  
 iii. Use the print function to print out the values of roll\_no and name for the 2 objects.

Q.4 A. Explain the concept of randomization and why it is required in design verification. 10  
 B. What is coverage and cross coverage? List and explain all types of Code coverage? 10

- Q.5 A. Explain immediate and concurrent assertions in detail. **10**
- B. Write the System Verilog code for the following items: **10**
- 1) Create a class Exercise1 containing two variables, 8-bit data and 4-bit address.  
Create a constraint block that keeps address to 3 or 4.
  - 2) Modify the above code for so that:  
data is always equal to 5  
Probability of address = 4'd0 is 10%  
Probability of address being between [1:14] is 80%  
Probability of address = 4'd15 is 10%
- Demonstrate its usage by generating 20 new data and address values and check for error.
- Q.6 A. Explain various Fork Join statements supported in System Verilog with proper examples. **10**
- B. Write all the methods associated with Events, Semaphores and mailbox. Mention the function of each of the methods and give example? **10**

(3 Hours)

[Total Marks: 80]

- N.B: (1) Questions No.1 is **compulsory**.  
 (2) Attempt **any three questions** out of remaining five questions.  
 (3) Assume suitable data if required.  
 (4) Figures to the right indicate full marks

Que.1 Answer the following (Any Four)

20

- Define the following terms and give their significance (i) Mean (ii) Central moment (iii) Variance (iv) Standard deviation.
- What is Entropy of an information source? When is entropy maximum?
- Compare intersymbol interference and interchannel interference
- Differentiate between QPSK and OQPSK
- Compare optical fibre with coaxial cable and twisted pair cable

Q2.

- Explain with neat diagram transmitter, receiver and waveforms the BPSK modulation System. Sketch signal space diagram and PSD of BPSK. 10
- A discrete memory less channel has an alphabet of six symbols, with the probabilities as given below

S1	S2	S3	S4	S5	S6
0.30	0.25	0.2	0.12	0.08	0.05

Construct the Huffman code and find entropy and average code word length of code  
 Also calculate the code efficiency and redundancy of the code 10

Q3.

- Linear block code having following parity check equations –  
 $c_4 = d_1 \oplus d_2 \oplus d_3$ ,  
 $c_5 = d_1 \oplus d_2$ ,  
 $c_6 = d_1 \oplus d_3$ .

Calculate

- G & H matrix
- error detection, Correction capacity of the code;
- decode the received codeword-----101100 10

b) Discuss the problem of inter symbol interference (ISI). Explain the measures to be taken to reduce ISI. How to study ISI using eye pattern? **10**

Q4.

a) Explain the working of Minimum Shift Keying, modulator and demodulator, with the help of block diagram and waveforms. **10**

b) Derive the expression for the probability of error of the matched filter. **10**

Q5)

a) Over a long transmission line draw the following data format for the binary sequence 10110100101. i) Unipolar NRZ ii) Polar RZ iii) Manchester Select the best and justify the answer. **10**

b) A (7, 4) cyclic code is generated using the generator polynomial  $g(x) = 1+x+x^3$   
i) Generate the systematic cyclic code for the data 1100 and 1001(MSB) by long division method  
ii) Draw the encoder and show how code words are generated for the data 1100, by tracing the path through the encoder and verify the result. **10**

Q6) Write a short note on **20**

- a) Duo-binary encoding
- b) QAM
- c) Satellite communication system
- d) Convolution code

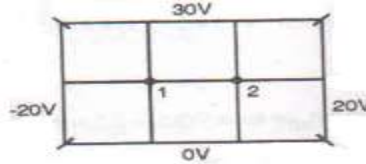
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Time: 3 Hours

[Total Marks: 80]

- Note:** (1) Question No.1 is compulsory.  
 (2) Solves any three out of remaining question.  
 (3) Assume suitable data if necessary.  
 (4) Figures to the right indicate full marks.

- Q.1** Attempt any Four
- (a) Derive Poisson's and Laplace equation. **05**
- (b) Explain boundary conditions of E and H fields for two media. **05**
- (c) Define Skin Depth, and calculate it for a wave travelling in a conductor ( $\sigma = 3.5 \times 10^7$  S/m), with a frequency of 100Mhz,  $\epsilon_r = 1.2$ ,  $\mu_r = 1$  **05**
- (d) Explain the radiation resistance, directivity, Beam-width and directive gain of the antenna. **05**
- (e) What is polarization? Explain all the types of polarization. **05**
- Q.2** (a) Derive Maxwell's equations in integral and point form for static field. **10**
- (b) State and Explain Poynting vector using modified Ampere's law, derive the pointing theorem and describe the significance of each of its terms. **10**
- Q.3** (a) Find the directive gain and directivity if  $U(\theta, \phi) = 10 \sin \theta \sin^2 \phi$ ,  $0 < \theta < \pi$ ,  $0 < \phi < 2\pi$ ; **05**
- (b) Derive an expression for reflection and transmission coefficient for normal incidence in case of reflection from perfect dielectric. **05**
- (c) Using finite difference method calculate the potential at node 1 and 2 shown in the figure **10**



- Q.4** (a) Drive the expression for radiation resistance in far field region of an Infinitesimal dipole antenna. **10**
- (b) Compare different methods used for computational electromagnetic. **05**
- (c) Explain the Mechanism of ionospheric propagation with its structure. **05**
- Q.5** (a) What is UPW? Derive wave equation and its solution for free space. **10**
- (b) Classify and Explain different types of wave Propagation and define the terms Critical frequency, Virtual height, Maximum unstable frequency and skip distance **10**
- Q.6** (a) A transmission line having  $Z_0 = 50 \Omega$ , length  $d = 0.15\lambda$ , is terminated by a load of  $Z_L = (25 - j30) \Omega$ . Calculate  $\Gamma_0$ , S and  $Z_{in}(d)$ . **05**
- (b) Derive an expression for transmission line equation. **05**
- (c) Calculate the SWR, reflection coefficient and admittance (Y) and Smith chart both for transmission line having  $Z_0 = 50 \Omega$ , Load impedance  $Z_L = 100 + j150 \Omega$ . **10**

[Time: 3 Hours]

[ Marks:80]

Please check whether you have got the right question paper.

- N.B:**
- 1. Question no.1 is compulsory**
  - 2. Solve any three from remaining questions.**
  - 3. Assume suitable data if necessary.**
  - 4. Diagrams to be drawn neatly.**

- Q.1 A) Draw the voltage follower using op-amp and show that its gain is unity. **5**
- B) What are active filters? State its advantages over passive filters. **5**
- C) Draw the functional block diagram of op-amp and explain each block. **5**
- D) Compare comparator and Schmitt trigger. **5**
- Q.2 A) Discuss classification of active filters and explain the frequency response of each type. **10**
- B) Design a differentiator to differentiate input signal that varies in frequency from 10 Hz to about 1 kHz. **10**
- Q.3 A) Define following terms for D/A converters: i) Resolution, ii) Accuracy, iii) Monotonicity, iv) Conversion time. **10**
- B) What is comparator? Explain the characteristics of comparators. **10**
- Q.4 A) Design an inverting Schmitt trigger to achieve hysteresis of 7 Volts. Assume voltage swing =  $\pm 12$ Volts. **10**
- B) Design a RC phase shift oscillator to have output frequency of 600Hz. Use  $\pm 15$ V supply. **10**
- Q.5 A) Explain the functional block diagram of IC 723 and state its important features. **10**
- B) Explain monostable timer circuit and design a monostable 555 timer circuit to produce an output pulse 10 sec wide. **10**
- Q.6 Write short note on following.
- A) Full wave precision rectifier using op-amp **5**
- B) Three pin fixed voltage regulators. **5**
- C) High frequency effect on operation of op-amp. **5**
- D) Voltage controlled oscillators (VCO) **5**

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NB:

1. Question No. 1 is compulsory and solve any THREE questions from remaining questions
2. Assume suitable data if necessary
3. Draw clean and neat diagrams

- |     |  |  | Marks |
|-----|--|--|-------|
| Q1. | Attempt any four   |  |       |
| a.  | Explain different types of database users in DBMS.   |  | 5     |
| b.  | Explain union and intersection operator in relational algebra with example   |  | 5     |
| c.  | What is the purpose of Views in DBMS? Write syntax of view   |  | 5     |
| d.  | What are the Pitfalls of Relational database design? Explain in short  |  | 5     |
| e.  | Discuss conflict serializability and view serializability in a schedule  |  | 5     |
| Q2. | a. Suppose that as the database administrator (DBA) in a hotel, you have to set up a database to capture all the following information that the hotel needs to maintain.   |  | 15    |
|     | <ul style="list-style-type: none"> <li>• The hotel offers three types of ROOMS, including single room, double room, and triple room. Every room is identified by its unique number.</li> <li>• Every employee at the hotel is either a receptionist, a cleaning staff, or a kitchen staff. Each RECEPTIONIST is identified with her/his name, employee number and years of experience. Receptionists are responsible for ensuring the room is clean before the room is assigned to the guest. Thus, they assign a single CLEANING TAFF to clean each room every morning and/or whenever it is required. Note that the same room may need to be cleaned several times on the same day, before it gets reassigned. For each cleaning assignment, the date and the status need to be provided. The KITCHEN STAFF is characterized by their specific responsibilities, e.g. being a cook or a waiter. The cleaning staff and the kitchen staff are also uniquely identified by their employee number.</li> <li>• Receptionists welcome GUESTS and upon presentation of their valid traveling documents, they allocate a unique room to each guest and specify one group of facilities which is accessible to the guest during his stay. Guests are uniquely identified with their passport number but other necessary information are also recorded about the guests, including: name, phone numbers, arrival date, departure date, and credit card number. Each FACILITY GROUP contains specific set of facilities, e.g. the bar or gym, in order to be used by the guests. The arrival and departure dates of a guest will in turn determine the occupation of a specific room</li> <li>• A guest can be accompanied with one person to have a double room or at most two people for a triple room. Each ACCOMPANYING person is identified by his/her name.</li> </ul> |  |       |
|     | Draw and explain ER diagram representing above information. Cleary show weak and strong entity (if any), type of participation and type of cardinality in your ER diagram  |  |       |
| b.  | What is data independence? Discuss its importance by giving an example of each level.  |  | 5     |



Q3. a. Consider “student” table

10

Stud_ID	Name	Phone	City	Country
1	Alex	654124	Perth	Australia
2	Martin	654125	Sydney	Australia
3	Shruti	910001	Delhi	India
4	Jaya	910002	Mumbai	India
5	Paul	450525	London	England
6	Andrew	450526	London	England

Write SQL queries by referring above relation.

1. Create above relation using sql command by considering STUD\_ID as primary key.
2. Write a query to display names that starts with letter 'a' from table Students.
3. Display total number of rows return by the table using aggregate function.
4. Display column Name in ascending order from table Students.
5. Display the records of student who are from the city Delhi or Mumbai

b Explain SQL aggregate functions with the help of an example

10

Q4 a. What is Normalization? Explain 1NF,2NF,3NF with example.

15

Relation R(ABCDEF) is given. Check the highest normal form in the relation. Functional dependencies are {AB->C, C->DE, E->F, F->A}

b. Explain various keys in Databae Management system

5

Q5 a. Discuss ACID properties of transaction in detail

10

b. Consider following relations

Customer(cid: integer, cname: string, address: string, city: string, state: string)  
 Product(pid: integer, pname: string, price: currency, inventory: integer)  
 Shipment(sid: integer, cid: integer, shipdate: Date/Time)  
 ShippedProduct(sid: integer, pid: integer, amount: integer)

10

Write relational algebra queries for the following:

1. Return the product name and price for all products with a price less than Rs.5.00
2. Return the id and names of all customers that have ever received a shipment where a product quantity (amount) in the shipment is greater than 20.
3. Return a list of all the customer names with addresses in the state 'CA' and have received a shipment prior to January 2,2014.

Return the product name and shipdate for all shipments that have an amount greater than the current inventory

Q6 a. What do you mean by deadlock with respect to transaction? Explain the procedure for deadlock handling

10

b. Discuss different types of concurrency control techniques in detail

10

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