ETRX

Paper / Subject Code: 32301 / Micro-controllers and Applications

TE/ SEM-V - CHOICE BASED / NOV-18

Time:-3 Hours **Marks:-80**

N.B: 1) Question No 1 is Compulsory

2) Attempt any three from remaining questions.

Q1) a) Justify why the ports of 8051 are initialised to FFH when operating in input Mode. (5)

b) Justify the statement "ARM Cortex M3 has reduced Power Consumption" (5)

c) Write the Instructions to access the On Chip Program Memory, On Chip Data Memory External Data Memory, instruction to Modify Bit addressable area respectively. What is Difference between MOV 20h, #01h and SETB 20H instructions. (5)

d) Calculate the Relative address for the Label "BACK" in the following Program (5)

P.C	Label	Instructions
0000H		MOV R0, #20H
0002H		MOV A, #50H
0004H		JZ LAST
0006H	BACK	INC R0
0007H		INC A
0008H		ADD R0,A
0009H		JNC BACK
000BH	HERE	SJMP HERE

Q2) a) Write a program to generate a wave with on time 4ms and off time 6ms on Port pin P1.5. Use Crystal Frequency =22 Mhtz. (10)

b) Write a Program to Transmit message "Mumbai" serially at 9600 Baud Rate. Show the Baud Rate Calculation. (10)

Q3 a) Explain the Programmer's Model and operating Modes of ARM Cortex M3 (10)

b) Write a Program to Generate a "Triangular wave" if SW1=0 and Ramp wave if SW1=1. Using DAC0808 (10)

Q4 a) Explain how interrupt Latency is Reduced in ARM Cortex M3. (10)

b) Explain the interrupt structure of 8051 and related registers used (10)

Q5) a) Write a Program to display the Temperature value obtained from the sensor LM35 connected to channel 3 of ADC 0808. (10)

b) Write a Program to Rotate a Stepper Motor continuously using half step 8 sequence. Assume the value stored in the Look-up Table stored at address 0400H (10)

Q6) Write Notes on any three (20)

a) MMU of ARM of Cortex M3

b) Significance of GATE pin of 8051.

c) IP Register

d) Application of Timer / Counter Mode of 8051

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TE / ETRX / Sem-V / CHOICE BASED / NOV 2018

(3 hours) Total marks: 80

N.B. : 1) Question no. 1 is compulsory
2) Attempt **any three** questions out of the remaining five questions
3) Assume suitable data if required, stating them clearly.

Q. 1 **Answer the following questions: (any four)** (20)

(a) For the bit sequence 10011101 draw the following line codes:
i) Polar RZ ii) AMI-RZ iii) Manchester iv) Unipolar NRZ

(b) State Shannon's theorem for Channel capacity. A Gaussian channel has 2MHz bandwidth. Calculate its Channel Capacity if the Signal to Noise Spectral density ratio is 10^4. Also calculate its maximum Information Rate.

(c) What are the properties of Matched Filter? Explain

(d) Define Bandwidth efficiency. Find the required bandwidth (Null-to-Null BW) of the following systems: BFSK, 16-PSK ,16-QASK , 16-FSK and QPSK , when Digital data is to be transmitted at a rate of 32 kbps.

(e) For a convolutional encoder with code rate 1/3 and constraint length 3 and generating Vectors g1= (1 1 1) , g2= (1 0 1) , g3= (1 1 0). (i) draw the encoder and find the codeword for the input sequence 10101. (ii) Sketch its state diagram

Q 2 (a) A discrete memory less source emits six messages with their probabilities as shown below: (10)

Symbol	S1	S2	S3	S4	S5	S6
Probability	0.12	0.26	0.18	0.34	0.4	0.06

Construct Huffman Code, find the Entropy of the source. Obtain the compact binary code and find the Average length of the Code, Code Efficiency and Code Redundancy

(b) What is ISI? What causes ISI? Derive the expression for ISI. Explain the methods to control the effect of ISI (10)

Q.3 (a) With reference to MSK system, explain the following: (10)
(i) Why MSK is called 'shaped QPSK'?
(ii) For the data sequence 101100011, sketch MSK waveform (m=5) on a graph paper

(b) Consider a Systematic block code whose Parity check equations are:

$$C_5 = m_1 + m_2 + m_3$$
$$C_6 = m_2 + m_3 + m_4$$
$$C_7 = m_1 + m_3 + m_4$$
$$C_8 = m_1 + m_2 + m_4$$

(i) find n, k for this code . Construct 'G' and 'H' matrices
(ii) find the codewords for the msg vectors : 1011, 1101
(iii) construct the syndrome look-up table.
(iv) If the received codeword is 10111110, find the error vector from the look-up table and compute the corrected codeword. (10)

Q.4 (a) With reference to Offset-QPSK, explain the following:
(i) transmitter and receiver with a neat block diagram along with mathematical expression for transmitted signal
(ii) sketch its PSD indicating the bandwidth
(iii) draw its constellation diagram and find its Euclidian distance
(iv) Compare OQPSK with QPSK. (4+2+2+2)

(b) Design a Feedback shift register encoder for a (8,5) cyclic code with generator Polynomial $g(x) = (1 + x + x^2 + x^3)$. (i)Find the codeword for the msg 10101, by tracing the path through the encoder in systematic form. (ii) draw the 'syndrome calculator' for the same and find the syndrome if the received codeword is 11010101 (5 +5)

Q.5 (a) With a neat diagram, explain how the Integrate and Dump Filter works as baseband receiver. Derive the expression for its probability of error. (10)

(b) The binary data 010100101 is applied to the input of a duobinary encoder
i) Construct the duobinary coder output and corresponding receiver output without precoding.
ii) Suppose that due to error during transmission, the logic level of the third digit is changed. Construct the new receiver output. What should be done to avoid error propagation? (10)

Q.6 (a) Draw the signal constellation diagrams for 16-PSK and 16-QASK and determine the Euclidian distance and Expression for Symbol Energy, E_S for both systems. Compare them and Comment about which of them has better noise immunity? (10)

(b) Write a short note on: (i) Optical communication system
(ii) Satellite communication system (10)

Time: 3 Hours **Max. Marks: 80**

Note: (1) Question number 1 is compulsory.
(2) Solve any THREE out of remaining.
(3) Assume suitable data if necessary.
(4) Figures to the right indicate full marks.

Q.1 Attempt any **FOUR**

(a) Starting with Maxwell's equations derive the expression for the wave equation for an electromagnetic wave propagating in a perfect dielectric. **(5)**

(b) Derive the Poisson's and Laplace's equations. **(5)**

(c) Explain the Dirichlet-type, Neumann-type and mixed boundary conditions. **(5)**

(d) Explain the radiation intensity, directivity and directive gain of the antenna. **(5)**

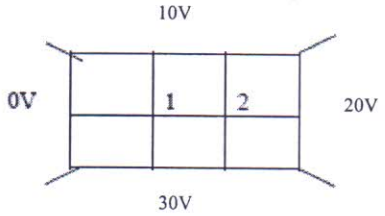
(e) State and explain Coulomb's law. Point charges 1mC and -2mC are located at (2,3,-1)m and (- 2,-1,4)m respectively. Calculate the electric force on a 10nC charge located at (0,3,1)m. **(5)**

Q. 2 **(a)** Derive Maxwell's equations in integral & Point form for time varying fields. **(10)**

(b) Define and explain skin depth. Derive the expression for the skin depth. Calculate the skin depth and the velocity of propagation for a uniform plane wave at a frequency of 100MHz traveling in aluminum. ϵ_r=1, μ_r=1, σ=3.5x10^7 S/m. **(10)**

Q.3 **(a)** Explain Poynting vector. Derive Poynting theorem and describe significance of each term. **(10)**

(b) Use the finite difference method to calculate the potentials at nodes 1 and 2 in the potential system shown in figure using iteration method and band matrix method. **(10)**



Q.4 **(a)** Derive the expression for radiation resistance in far field region of an infinitesimal dipole. **(10)**

(b) Find the directive gain and directivity if $U(\theta,\phi) = 10\sin\theta\sin^2\phi$, $0<\theta<\pi$, $0<\phi<2\pi$. **(5)**

(c) An antenna has a field pattern given by $E(\theta) = \sin^2 2\theta$ for $0<\theta<\pi$. Find the half power beamwidth and the first null beamwidth. **(5)**

Q.5 **(a)** Explain sky wave propagation. **(5)**
Calculate the skip distance for flat earth with MUF of 20 MHz if the wave is reflected from a height of 200km where the maximum value of refractive index of the earth is 0.95. **(5)**

(b) What is line of sight propagation? Obtain expression for range of line of sight for space wave propagation in terms of antenna's transmitting and receiving heights. **(10)**

Q.6 (a) A transmission line is lossless and 0.25m long. It is terminated in a load of $Z_L=50+j25\Omega$ at a frequency of 10MHz. The inductance and the capacitance of the line are 12.5μH/m and 5nF/m, respectively. Use Smith chart to find the reflection coefficient, VSWR, the input impedance at the source. **(05)**

(b) Find the characteristic impedance and propagation constant of a transmission line if R=4Ω/m, L=6nH/m, G=0.8m℧/m, and C=0.3pF/m, the operating frequency of the transmission line is 100MHz. **(05)**

(c) Derive the expression for the input impedance of a transmission line. **(10)**

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ETRX/ Paper / Subject Code: 32304 / Design Wth Linear Integrated Circuits

Sem-V- CHOICE BASED / NOV. 2018

[Time: 3 Hours] [Marks:80]

Please check whether you have got the right question paper.

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

Q.1	A)	Define following OPAMP parameters. 1) C.M.R.R 2) Slew rate 3) Input offset voltage 4) Input bias current 5) output resistance	05
	B)	What are comparators? How are they classified, state applications of comparators.	05
	C)	What are active filters? How are they classified? State its applications.	05
	D)	Draw the block diagram and explain the operation of switching regulator.	05
Q.2	A)	Design second order high pass filter using OPAMP at f_0= 1KHZ and with gain at 2.	10
	B)	Draw block diagram and explain function of each block of operational amplifier.	10
Q.3	A)	Draw circuit diagram of temperature compensated log amplifier and explain its operation. State its applications.	10
	B)	Draw circuit diagram and explain the operation of parallel comparator (flash type) ADC. State its advantages and disadvantages.	10
Q.4	A)	Design a monostable multivibrator to produce an output pulse 10 second wide. Draw neat circuit diagram and all the waveforms.	10
	B)	Draw the circuit diagram and explain the operation of triangular wave generator using OPAMP. Explain the modifications required to obtain saw tooth wave output.	10
Q.5	A)	Draw block diagram and explain the operation of PLL (phase locked 100P). State its applications.	10
	B)	Explain with circuit diagram 1) short circuit protection 2) fold back current limiting in 723 IC voltage regulator.	10
Q.6		Write notes on following (Any two) 1) RC phase shitt oscillator using OPAMP. 2) Schmitt trigger and its applications. 3) Instrumentation amplifier.	20

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Sem - V - Choice Base

Q3. a. Explain different relational algebra operators with the help of an example. Also explain the following terms with the help of relational algebra: Set intersection, set difference, natural join 10

b Explain different types of integrity constraints with the help of example of each type, that can be enforced on a database 10

Q4 a. To keep track of office furniture, computers, printers, and other office equipment, the ABC Corporation uses the table structure shown in Table below: 15

Attribute Name	Sample Value	Sample Value	Sample Value
ITEM_ID	231134-678	342245-225	254668-449
ITEM_LABEL	HP DeskJet 895Cse	HP Toner	DT Scanner
ROOM_NUMBER	325	325	123
BLDG_CODE	NTC	NTC	CSF
BLDG_NAME	Nottooclear	Nottooclear	Canseefar
BLDG_MANAGER	I. B. Rightonit	I. B. Rightonit	May B. Next

1. Draw the dependency diagram. Make sure that you label the transitive and/or partial dependencies.
2. Starting with the dependency diagram drawn above create a set of dependency diagrams that meet 3NF requirements. Rename attributes to meet the naming conventions, and create new entities and attributes as necessary.

b. Explain following types of attributes with the help of an example for each type: i)single valued ii) multivalued iii) composite iv) derived 5

Q5 a. Draw the state diagram for a transaction. Discuss every state in brief with the help of an example. 10

b. Consider the following database: 10

Product (maker, model, type)
PC (model, speed, ram, hd, price)
Laptop (model, speed, ram, hd, screen, price)
Printer (model, color, type, price)

The Product relation gives the manufacturer, model number and type (PC, laptop, or printer) of various products. We assume for convenience that model numbers are unique over all manufacturers The PC relation gives for each model number that is a PC the speed (of the processor, in gigahertz), the amount of RAM (in megabytes), the size of the hard disk (in gigabytes), and the price.

Write SQL queries for the following (any FIVE)

1. Find the model number, speed and hard drive capacity for all the PCs with prices below $500
2. Find the makers of PCs with a processor speed of 450 MHz or more
3. Find out the average speed of the PCs produced by maker A.

ETRX / Paper / Subject Code: 32305 / Elective - I DataBase and Management System (DLOC) / NOV-2

Sem-V - choice Based.

(3 hrs.) Maximum Marks = 80

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.	Discuss in brief: advantages of database system over traditional file system	5
	b.	Explain generalization and specialization with respect to EER model	5
	c.	Explain Data Definition Language (DDL) and Data Manipulation Language (DML) with example	5
	d.	Define following terms: i) super key ii) candidate key iii) primary key iv) foreign key v) unique constraint	5
	e.	Discuss ACID properties of transaction	5
Q2.	a.	Consider bank database	15

- The bank is organized into branches. Each branch is located in a particular city and is identified by a unique name. The bank monitors the assets of each branch.
- Bank customers are identified by their customer-id value. The bank stores each customer's name, and the street and the city where the customer lives. Customers may have accounts and can take out loans.
- The bank offers two types of accounts: savings and checking accounts. Accounts can be held by more than one customer, and a customer can have more than one account. Each account is assigned a unique account number. In addition, each savings account has an interest rate, and overdrafts are recorded for each checking account.
- The bank provides its customers with loans. A loan originates at a particular branch and can be held by one or more customers. A loan is identified by unique loan number. For each loan, the bank keeps track of loan amount and the loan payments.
- Bank employees are identified by their employee-id values. The bank administration stores the name and telephone number of each employee, the names of the employee's dependents, and the employee-id number of the employee's manager. The bank also keeps track of the employee's start date and, thus, length of employment

Draw and explain E-R diagram for the above database. Show clearly following things in E-R diagram

1. Mapping cardinalities
2. Weak / Strong entity (if any)
3. Relationship set
4. Primary key

b. Explain different types of database users 5

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4. Find the makers producing at least three distinct models of PCs. Result set: maker, number of PC models
5. Get the laptop models that have a speed smaller than the speed of any PC. Result set: type, model, speed.
6. Find the model number and maker of the lowest priced PC that has 64MB or more memory.

Q6 a. 1. What do you mean by "conflict serializable schedule"? 10

2. State whether following schedule is conflict serializable with justification (refer fig a)
3. Discuss the consistency of the database after execution of following schedule (refer fig b)

T_1	T_2
read(A)	
write(A)	
	read(A)
	write(A)
read(B)	
write(B)	
	read(B)
	write(B)

Figure a

T_1	T_2
read(A)	
$A := A - 50$	
	read(A)
	$temp := A * 0.1$
	$A := A - temp$
	write(A)
	read(B)
write(A)	
read(B)	
$B := B + 50$	
write(B)	
commit	
	$B := B + temp$
	write(B)
	commit

Figure b

b. Design a generalization–specialization hierarchy for a motor vehicle sales company. The company sells motorcycles, passenger cars, vans, and buses. Justify your placement of attributes at each level of the hierarchy. Explain why they should not be placed at a higher or lower level 10

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ETRX / Paper / Subject Code: 32306 / Elective - I Digital Control System (DLOC) / NOV-2018

Sem-V - choice Based.

(3 hours) [Total Marks: 80]

Note:

1. Question-1 is compulsory.
2. Answer any three questions from remaining five.
3. Assume suitable data if necessary.
4. Numbers in the right indicate marks.

1. Answer the following questions. (Each question carry 5 marks) 20

(a) Describe the data holding in digital systems and derive the transfer function of zero-order hold (ZOH).

(b) Draw the frequency spectrum of the ideal low-pass filter and comment on its realizability with justification.

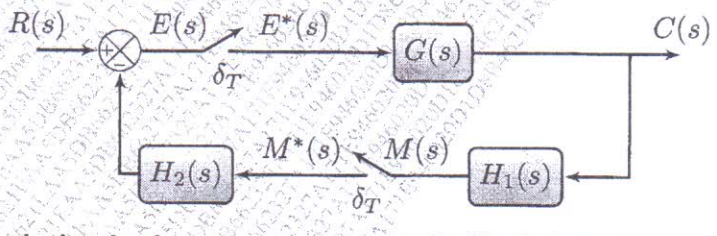
(c) Explain quantization in digital control systems and derive the bound on the quantization error.

(d) Clearly explain the distinction between detectability and observability for discrete-time systems.

2. (a) Describe bilinear transformation approach for discretization of continuous-time systems in detail. Also, comment on the mapping between s-plane and z-plane under such discretization. 10

(b) Discretize continuous-time PID controller using trapezoidal rule to approximate integral term and two-point difference to approximate derivative term. 10

3. (a) Derive the closed-loop pulse transfer function $\frac{C(s)}{R(s)}$ for the digital control system shown in figure below. Assume sampling time to be 1 second. 10



(b) Make a rough sketch of root locus of a unity feedback digital control system whose open loop transfer function is given as 10

$$G(z) = \frac{Kz(1-e^T)}{(z-1)(z-e^T)}$$

Also determine the critical value of K. Take sampling frequency $f_s = 1$Hz.

4. (a) Design the state feedback controller $u[k] = Kx[k] + k_0 r[k]$ such that the steady-state error of the closed loop is zero for the unit step input. 10

$$x[k+1] = \begin{bmatrix} -0.6 & 0 & 0 \\ 0 & 0.3 & 0 \\ 0 & 0 & -0.8 \end{bmatrix} x[k] + \begin{bmatrix} 2 \\ 0.6 \\ 1 \end{bmatrix} u[k]$$

(b) Represent the discrete-time system of **Q-4(a)** in controllable canonical form and observable canonical form using similarity transforms. 10

5. (a) Discretize the continuous time state-space equation $\dot{x} = Ax + Bu$ and obtain the discrete-time state-space representation. 10

(b) Design a deadbeat controller for the following discrete-time system. 10

$$x[k+1] = \begin{bmatrix} 1 & 2 \\ 1 & 1 \end{bmatrix} x[k] + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u[k]$$

6. Answer any three of the following questions. 20

(a) Derive the mapping between s-plane and z-plane when discretizing a continuous-time system using impulse invariance approach. Determine the region of stability on z-plane under this mapping.

(b) Determine the stability of a discrete-time system which has characteristic equation $z^4 + 1 = 0$.

(c) Explain the distinction between observability and detectability.
