E / Sem - V / Paper / Subject Code: 32301 / Micro-controllers and Applications / May - 2019
choice based / GTRX.

(3 Hours) [Total Marks: 80]

Note:-1. Q.1 is compulsory

2. Out of remaining 5 solve any 3 questions

3. Figures to the right indicate full marks

Q.1 Solve **any 4**

a. Explain following instructions of 8051 5

i) INC @R0 ii) MOVX A, @R1 iii) ACALL address iv) RRC A v) XRL direct, data

b. A switch is connected to pin P2.0 and an LED to pin P1.7 .Write a program to get status of the switch and send it to the LED. 5

c. What is Thumb2 mode of operation of Cortex M3? State its advantages. 5

d. Ten 8 bit numbers are stored in internal data memory from location 50H. Write a program to increment the data.

e. Show Interfacing of a dc motor to microcontroller. 5

Q.2 a. Explain various addressing modes of 8051 with examples 10

b. Assume that the stack pointer points to memory location 3FH and the contents of the memory location 30H, 31H and 32H are 00, 88,and FF respectively. Illustrate the stack contents after the execution of each of the following instructions. 5

PUSH 30H

PUSH 31H

PUSH 32H

c. Write an assembly language program to generate a delay of 100 msec. 5

Q.3 a. Write a program to transfer message 'NO' serially with baud rate of 9600 continuously. 10

b. Explain various timer modes for 8051 10

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Q.4 a. Explain various operating states of Cortex-M3 with thread and handler modes. 10

b. Explain interfacing of stepper motor to 8051 and write a assembly language program to rotate it in clockwise direction. 10

Q.5 a. Write an assembly language program for 8051 to display predefined message on LCD. 10

b. Explain register architecture of Cortex-M3 10

Q.6 Write short notes on **any 4** 20

a. NVIC in Cortex-M3

b. Interrupts in 8051

c. Interfacing ADC to 8051

d. Internal memory organization of 8051

e. Assembler directives in 8051

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(3 HOURS) TOTAL MARKS:80

N.B
1. Question No. 1 is compulsory.
2. Solve **any three** questions from remaining five questions.
3. Draw neat diagrams wherever necessary.
4. Assume suitable data if required.

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

a) Three equal point charges of 2μC are located at (0,0,0)m, (2,0,0)m and (0,2,0)m respectively in free space. Find out net force on Q4 = 5μC at (2,2,0)m.

b) Derive the wave equation for time varying Harmonic Fields in free space.

c) Compare MOM, FDM and FEM.

d) Explain Beam Width of an antenna.
An antenna has a field pattern given by $E(\theta)= \cos^2 \theta$ for $0^o \leq \theta \leq 90^o$. Find its Half Power width.

e) Define Critical Frequency and MUF. Calculate the critical frequency where the maximum value of n is 0.9 with a MUF of 10MHz.

Q 2

a) Given $V= 2x^2y-5xz$, find: V, **E** , **D** and ρ_v at P(-4,3,6)m. (10)

b) Given $\vec{E} = 1.5 \cos(10^8 t-\beta z)\, \overrightarrow{a_x}$ V/m , Obtain **B, H** and **D**. Assume $\varepsilon_r=1$ and $\mu_r=1$, $\sigma=0$ (10)

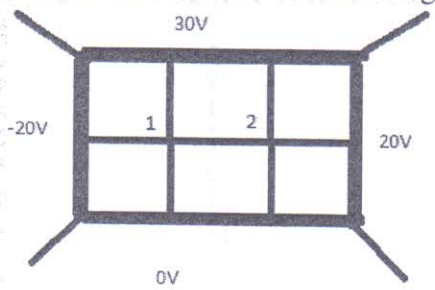
Q 3

a) Derive the boundary conditions for Electric and Magnetic fields at the boundary of two dielectric media. (10)

b) In free space, a plane wave with $\overrightarrow{H_i}= 10\cos(10^8 t-\beta z)\, \overrightarrow{a_x}$ mA/m is incident normally on a lossless medium with $\varepsilon=\varepsilon_0$, $\mu=\mu_0$ in region $z\geq 0$. Determine H_r, E_r for the reflected wave and H_t, E_t for the transmitted wave. (10)

Q 4

a) Use the Iterative finite difference method and band matrix method to calculate potential at nodes 1 and 2 in the figure shown below: (10)



b) State Poynting Theorem and derive an expression for the Poynting vector. Explain the power terms mentioned in the derivation.

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Q 5

a) An electric field strength of 10μV/m is to be measured at an observation point $\Theta=\pi/2$, 500km from a half wave dipole antenna operating in air at 50 MHz. What is the length of the dipole? If the transmission line with $Z_O=75\Omega$ is connected to the antenna, determine Γ and standing wave ratio using Smith Chart. (10)

b) A distortion less line has Z_O =50 Ω, α = 50 Np/m, v =0.6c where c is the speed of light in vacuum. Determine R, L, G, C and λ at 100MHz. (10)

Q 6

a) Explain the factors affecting the field strength of space wave signal. (05)

b) Explain the concept of retarded potential. (05)

c) Derive the relationship between effective area and Directivity. (05)

d) Write the generalized Maxwell's Equations in point form and integral form. (05)

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E/ Sem. V / Paper / Subject Code: 32304 / Design Wth Linear Integrated Circuits / May - 19

ETRX - choice Based

Duration: 3 Hours **Marks: 80**

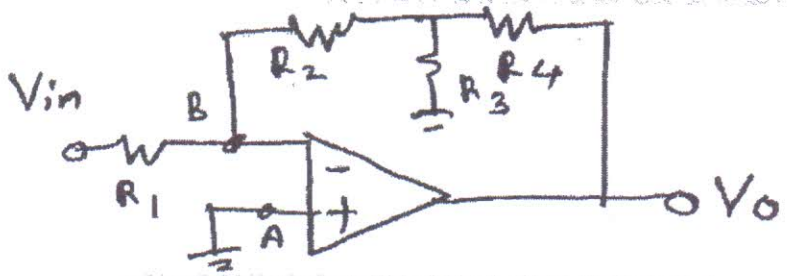
Instructions:

(1) Question 1 is compulsory, solve any three from remaining questions

(2) Assume suitable data if necessary.

(3) Diagrams to be drawn neatly.

Q1(A) Determine Vo/ Vin for the circuit shown below – 05



Q1(B) Draw the circuit diagram and explain the operation of zero crossing detector. 05

Q1(C) Explain specifications of ADC. 05

Q1(D) What are active filters? State its advantages over passive filters 05

Q2(A) Draw the circuit diagram and explain the operation of differentiator. What are limitations of ideal differentiator? How they are overcome in practical circuit ,state its application areas. 10

Q2(B) Design first order low pass fitter using opamp at a cut off frequency of 1Khz ,having pass band gain of 2. 10

Q3(A)	Draw the circuit diagram and explain the operation of precision full wave rectifier. Derive the expression of output voltage.	10
Q3(B)	Design triangular wave generator using opamp to have output voltage = 7VPP volts,frequency 2 kHZ,with supply voltage +/- 14 V.	10
Q4(A)	Draw neat circuit diagram and explain the operation of successive approximation type analog to digital converter. What are its advantages and disadvantages.	10
Q4(B)	Draw neat circuit diagram and explain the operation of monostable multivibrator using IC 555.	10
		10
Q5(A)	Design a IC 555 based symmetrical square wave generator for 1 KHz frequency of Vcc= 5 V.Draw waveforms for voltage across timing capacitor and output.	
Q5(B)	Design voltage regulator using IC 723 to have Io = 50mA,Isc = 75 milli amp.,Vin = 15 V.Assume Vsense = 0.6 V and Vo = 5 V.	10
	Solve any **TWO** of the following.	
Q6(A)	Functional block diagram and working of IC 723.	10
Q6(B)	PLL(Phase lock loop) and its applications.	10
Q6(C)	Wein bridge oscillator using opamp.	10

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Sem - V / Paper / Subject Code: 32305 / Elective - I Data Base and Management System / May-2019

TRX / choice based.

(3 Hours) Marks :80

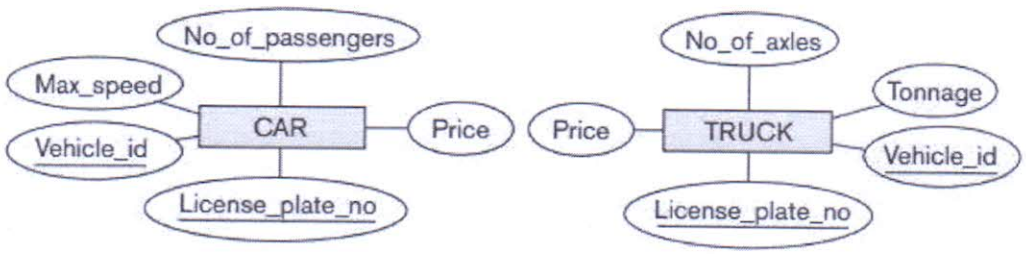
NB:

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

Q1. Attempt any four

a. Discuss the duties of database administrator 5

b. 5



Generalize CAR and TRUCK into the superclass VEHICLE

c. Explain Transaction Control Commands (TCL) 5

d. Discuss partial dependency and transitive dependency with the help of an example 5

e. Discuss various types of transaction failures 5

Q2. a. A database is being constructed to keep track of the teams and games of a sports league. A team has a number of players, not all of whom participate in each game. It is desired to keep track of the players participating in each game for each team, the positions they played in that game, and the result of the game. Design an ER schema diagram for this application, stating any assumptions you make. Choose your favorite team sport (e.g., baseball, curling, kabbadi, ...). Be sure your design is described in a way understandable by someone not familiar with that sport. 15

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 Two-tier and Three-tier architectures of database system 5

Consider following relations

Q3. a.

STUDENT

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

INSTRUCTOR

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Yao
Francis	Johnson
Ramesh	Shah

Write the output for the following queries 10

1. STUDENT ∪ INSTRUCTOR
2. INSTRUCTOR – STUDENT
3. STUDENT – INSTRUCTOR
4. STUDENT ∩ INSTRUCTOR

b Explain SQL aggregate functions with the help of an example 10

Q4 a. Explain the need of database normalization. Discuss the steps to convert the given database in 3NF **10**

b. Explain following types of attributes with the help of an example for each type: i) single valued ii) multivalued. Define weak entity and strong entity **10**

Q5 a. Discuss ACID properties of transaction in detail **10**

b. Consider the following database: **10**

Movies(title, year, length, genre, studioName, producer)
StarsIn(movieTitle, movieYear, starName)
MovieStar(name, address, gender, birthdate)
MovieExec(name, address, cert#, netWorth)
Studio(name, address, pres)

With reference tom above database write SQL queries for the following: (any FIVE)

1. Who were the male stars in Titanic?
2. Find the title of all MGM movies produced after 1970 or that run for less than 90 minutes
3. Find all the stars that appeared either in a movie made in 1980 or a movie with "Love" in the title.
4. Which movies are longer than Gone With the Wind?
5. Find all the stars who either are male or live in Miami
6. Find all executives worth at least $10,000,000.

Q6 a. What do you mean by deadlock with respect to transaction? Explain the procedure for deadlock handling **10**

b. Write short notes on EER model. **10**

(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 any four of the following questions. (Each question carry 5 marks) 20

(a) Derive the relationship between discrete state space model and pulse transfer function.

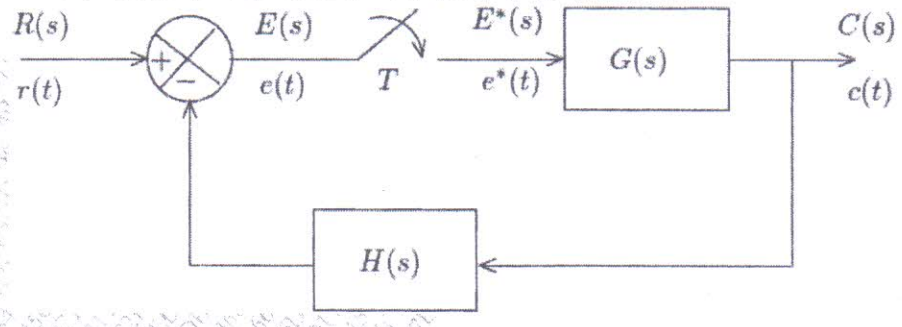
(b) What is an observer? Why is it required?

(c) What are the advantages of state variable method for analysis of digital control system?

(d) State and explain Jury's stability criterion.

(e) Is it possible for an unobservable system to be detectable? Justify your answer.

2. (a) Obtain the closed loop transfer function for the following system $G(s) = 1/s(s+1)$, $H(s) = 1$ 10



(b) Derive the relation between s plane and z plane using Bilinear Transformation technique. 10

3. (a) For the given system obtain the state transmission matrix using Cayley-Hamilton method 10

$$x[k+1] = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x[k] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u[k]$$

$$y[k] = [1 \quad 0]x[k], \qquad x[0] = [1 \quad 1]^T$$

(b) Consider the following system 10

$$\frac{Y(z)}{U(z)} = \frac{z+1}{z^2+1.3z+0.4}$$

Represent the system in controllable canonical form, observable canonical form and diagonal canonical form.

4. (a) Investigate the controllability and observability for the following system 10

$$x[k+1] = \begin{bmatrix} 0 & 1 \\ -0.4 & -1.3 \end{bmatrix} x[k] + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u[k]$$

$$y[k] = [0.8 \quad 10]x[k]$$

(b) State and prove the Nyquist sampling theorem. 10

5. (a) Show that the following system is not completely observable 10

$$x[k+1] = Gx[k] + Hu[k]$$
$$y[k] = Cx[k]$$

where, $G = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}$, $H = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, $C = [4 \quad 5 \quad 1]$

(b) Obtain the block diagram for the following pulse transfer function by 1) direct programming 2) standard programming 3) ladder programming 10

$$\frac{Y(z)}{U(z)} = \frac{2 - 0.6z^{-1}}{1 + 0.5z^{-1}}$$

6. Answer any two of the following questions. 20

(a) Distinguish between reachability and controllability in discrete time systems.

(b) Explain dead beat control using state feedback.

(c) Write short note on state observer based controller design.

(d) Digital PID controller.

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