(15)

T3125 / T0517 MICROCONTROLLERS AND APPLICATIONS

23/5/17

TE- Sem-V -CBSGS- EXTC

Q.P. Code : 587902

(3 Hours) **[Total Marks : 80**

N.B.

1. Question No. 1 is compulsory
2. Attempt any 3 questions from Q.2 to Q6.
3. Figures to the right in the bracket indicate full marks
4. Assume suitable data if necessary

Q1 A) Explain program status register of 8051 Microcontroller [5 M]

Q1 B) Explain features of ARM 7 [5 M]

Q1 C) Explain concept of Cortex-A,Cortex-R and Cortex-M [5 M]

Q1 D) Explain SCON register of 8051 microcontroller [5 M]

Q2 A) Draw and explain internal memory organization of 8051 microcontroller [10M]

Q2 B) Explain addressing modes of ARM7 processor with examples. [10M]

Q3 A) Draw and explain architecture of ARM7 processor. [10M]

Q3 B) Explain timer modes of operation of 8051 microcontroller [10M]

Q4 A) Explain digital camera as an example of embedded system. [10M]

Q4 B) Design a 8051 based system with following specifications [10M]

i) 32KB EPROM using 8KB devices.

ii) 16KB RAM using 8KB devices.

Q5 A) Explain ARM instructions

a) EOR R1, R0, #3

b) MLA R4, R3, R7, R8

c) CMP R0, R1

d) ADD R0, R2, R3, LSL #1

e) MVN R0, #4

Q5 B) Draw and explain internal structure of port0 and port3 of 8051 microcontroller [10M]

Q6 Write short notes on [**Any Four**]

a) Compare features of 89C51, 89C52, 89C2051 and 89C2052 [5 M]

b) Operating modes of ARM7 processor. [5 M]

c) Design metrices of embedded system. [5 M]

d) Addressing modes of 8051 microcontroller. [5 M]

e) Interrupt structure of 8051 microcontroller. [5 M]

---

(19)

TE - sem-V - OBSG - EXTC

5/6/17

Q.P. Code : 588101

(3 Hours) **[Total Marks : 80**

N.B. : (1) Question **No.1** is **compulsory**.
(2) Attempt **any three** questions out of remaining **five**.
(3) **Figures** to the **right** indicate **full marks**.
(4) Assume suitable **data** if **required** and **mention** the same in **answer sheet**.

1. Solve **any four** :- **20**
   (a) Classify and explain the various types of noise affecting communication.
   (b) AM is a wastage of power and bandwidth, justify the statement.
   (c) Compare between FM and PM.
   (d) Explain Pre-emphasis and De-emphasis.
   (e) What is companding.

2. (a) A modulating signal 20 sin ($2\pi \times 1000$ t) is used to modulate a carrier signal 80 sin ($2\pi \times 10000\ t$). Find the percentage modulation, frequencies of the sideband components and their amplitudes. What is the BW of the modulated signal? Also draw the spectrum of the AM wave. **10**
   (b) Explain with neat block diagram **any one** method for suppression of unwanted sideband. **10**

3. (a) What are different methods of FM generation? Sketch the circuit and explain the principle of reactance modulator? **10**
   (b) State and prove sampling theorem for band limited signal. What is aliasing effect? **10**

4. (a) Explain with neat block diagram working of Adaptive delta modulator. What are the drawbacks of delta modulator? **10**
   (b) What is signal multiplexing? Explain FDM in detail. **10**

5. (a) Explain with neat block diagram and waveform of AM Super- heterodyne radio receiver. **10**
   (b) Explain operation of Foster Seeley discriminator with the help of circuit and phasor diagram. **10**

TURN OVER

Q.P. Code : 588101

6. Write short notes on **any four** :- 20

(a) Vestigial Side Band (VSB) transmission.

(b) Practical diode detector with delayed AGC.

(c) Generation and detection of PPM.

(d) Amplitude limiting and thresholding in FM.

(e) Quadrature amplitude modulation.

---

(22) TE-Sem-~~VII~~ V - CBSGS - EXTC - PSA 17/5/17

Q.P. Code : 587801

(03 Hrs.) Total Marks: 80

N.B.:

1) **Question Number 1 is Compulsory**
2) Attempt any **Three** questions from the remaining **Five** questions
3) Assumptions made should be clearly stated.
4) Use of normal table is permitted

---

1 Answer the following

a) For an LTI system with stochastic input prove that autocorrelation of output is given by convolution of cross-correlation (between input-output) and LTI system impulse response. 05

b) Suppose that a pair of fair dice are tossed and let the RV X denote the sum of the points. Obtain probability mass function and cumulative distribution function for X. 05

c) If $Z = X + Y$ and if X and Y are independent then derive pdf of Z as convolution of pdf of X and Y. 05

d) Write a note on the Markov chains. 05

2a) Define and Explain moment generating function in detail. 05

b) Let $Z = X/Y$. Determine $f_Z(z)$ 05

c) The joint cdf of a bivariate r.v. (X, Y) is given by

$$F_{XY}(x,y) = \left(1 - e^{-\alpha x}\right)\left(1 - e^{-\beta y}\right), x \geq 0, y \geq 0, \alpha, \beta > 0$$
$$= 0 \text{ otherwise.}$$

i) Find the marginal cdf's of X & Y. 02
ii) Show that X & Y are independent. 02
iii) Find $P(X \leq 1, Y \leq 1)$, $P(X \leq 1)$, $P(Y > 1)$ & $P(X > x, Y > y)$ 06

3a) Explain strong law of large numbers and weak law of large numbers. 05

b) Write a note on birth and death queuing models. 05

c) A distribution with unknown mean μ has variance equal to 1.5. Use central limit theorem to find how large a sample should be taken from the distribution in order that the probability will be at least 0.90 that the sample mean will be within 0.5 of the population mean. 10

4a) State and prove Chapman-Kolmogorov equation. 05

b) State and prove Bayes theorem. 05

c) (i) State any three properties of power spectral density. 03
(ii) If the spectral density of a WSS process is given by 07

$$S(\omega) = b(a - |\omega|)/a, \quad |\omega| \leq a$$
$$= 0 \quad , \quad |\omega| > a$$

Find the autocorrelation function of the process.

5a) The joint probability function of two discrete r.v.'s X and Y is given by $f(x, y) = c(2x + y)$, where x and y can assume all integers such that $0 \leq x \leq 2$, $0 \leq y \leq 3$ and $f(x, y) = 0$ otherwise. Find $E(X)$, $E(Y)$, $E(XY)$, $E(X^2)$, $E(Y^2)$, $\text{var}(X)$, $\text{var}(Y)$, $\text{cov}(X, Y)$, and ρ. 10

---

b) Prove that if input LTI system is WSS the output is also WSS. What is ergodic process? 10

6a) The transition probability matrix of Markov Chain is 05

$$\begin{array}{c} \\ 1 \\ 2 \\ 3 \end{array} \begin{array}{c} \begin{array}{ccc} 1 & 2 & 3 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 \\ \frac{1}{4} & 0 & \frac{3}{4} \\ \frac{3}{4} & \frac{1}{4} & 0 \end{bmatrix} \end{array}$$

Find the limiting probabilities.

b) An information source generates symbols at random from a four letter alphabet $\{a, b, c, d\}$ with probabilities $P(a) = 1/2$, $P(b) = \frac{1}{4}$ and $P(c) = P(d) = 1/8$. A coding scheme encodes these symbols into binary codes as follows: 05

a	0
b	10
c	110
d	111

Let X be the random variable denoting the length of the code, ie, the number of binary symbols.

i) What is the range of X?

ii) Sketch the cdf $F_X(x)$ of X, and specify the type of X.

iii) Find $P(X \leq 1)$, $P(1 < X \leq 2)$, $P(X > 1)$ & $P(1 \leq X \leq 2)$.

c) Write notes on the following: 10

i) Block diagram and explanation of single & multiple server queuing system

ii) M/M/1/∞ queuing system

END

TE-sem-V- CBSGS- EXTC

29/5/17

T3125 / T0518 R F MODELING AND ANTENNAS

Q.P. Code : 588001

(3 Hours)

[Total Marks 80]

N.B. 1) Question No.1 is Compulsory.
2) Solve any three questions from the remaining.
3) Assume suitable data wherever necessary and justify the assumption.
4) Draw suitable diagrams wherever required.

1. a) Compare Binomal filter and chebyshev filter. 5
   b) What is reactive near field. Explain its importance in communication and its applications. 5
   c) Compare Broadside and Endfire array. 5
   d) Find the gain of an antenna when physical aperture is 5 m^2 at 2 GHz with efficiency 70%. 5

2. a) Design a composit high pass filter by image parameter method with the following specification. 10
   $R_o = 75\ \Omega$, $f_c = 50$ MHz, $f_\infty = 48$ MHz.
   b) Design a LPF whose input and output ports are matched to 50Ω impedance with cut off frequency of 3 GHz, equi ripple of 0.5 dB and rejection of atleast 40 dB at approx twice the cut off frequency. 10

3. a) Derive friss transmission formula state its significance in wireless communicaiton. What is maximum power received at a distance of 0.75 km over free space for 1GHz frequency. The system consist of transmitting antenna with 3dB gain and receiving antenna with 17dB gain and antenna is fed with 200 W power. 10
   b) Derive radiation resistance of small dipole. Explain its significance. 10

4. a) Find the radiation pattern for an array of 4 elements fed with same amplitude and opposite phase. Find its HPBW and BWFN. 10
   b) Draw the structure of microstrip antenna. Discuss its characteristics, limitations and applications. 10

5. a) Describe parabolic reflector antenna and its different feeding methods. 10
   b) Explain important features of loop antenna. Discuss use of loop antenna in radio direction finding. 10

6. **Write short notes on :** 20
   a) RF field effect transistor
   b) Binomial array
   c) RF behavior of resistor and capacitor
   d) Helical antenna

****