CBCS SCHEME

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15EE52

Fifth Semester B.E. Degree Examination, July/August 2021
Microcontroller

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions.

1 a. List and explain the salient features of 8051. And sketch the internal block diagram of 8051 neatly. **(08 Marks)**

b. Explain briefly the any four addressing modes of 8051 with an example for each. **(08 Marks)**

2 a. Explain the internal memory organization of 8051. **(05 Marks)**

b. Briefly explain the dual functions of port 3 pins of 8051. **(05 Marks)**

c. Explain the following in brief:
(i) The pin that connects external memory
(ii) The port that has open drain output
(iii) PSW **(06 Marks)**

3 a. Explain ORG, END, DB and EQU directives with example. **(04 Marks)**

b. Explain the different types of conditional and unconditional jump instructions of 8051. Specify the different ranges associated with jump instructions. **(08 Marks)**

c. Explain the following instructions of 8051 with example (values):
(i) SWAP A (ii) DA A
(iii) MUX AB (iv) CJNE A, # 01, TARGET **(04 Marks)**

4 a. In a semester, a student has to take six courses. The marks of the student (out of 25) are stored in RAM locations 47H onwards. Write an ALP to find the average marks and output it on port 1. **(08 Marks)**

b. Write an ALP to create a square wave of 50% duty cycle on bit 0 of port 1. Write delay subroutine without timers. **(08 Marks)**

5 a. Explain the TMOD and TCON register of 8051 timers. **(08 Marks)**

b. Explain C data types for 8051 with their data size in bits and data range. **(04 Marks)**

c. Write an 8051 C program to monitor bit P1.5. If it is high, send 55H to P0; otherwise, send AAH to P2. **(04 Marks)**

6 a. Explain the characteristics and operation of mode 1 of timer with neat diagram. **(08 Marks)**

b. Generate a square wave with an ON time of 3 ms and an OFF time of 10 ms on all pins of port 0. Assume XTAL = 22 MHz. Use timer 0 in mode 1. **(08 Marks)**

7 a. Explain SCON registers with its bit pattern. **(08 Marks)**

b. Write a 8051 program to send the data message "MICROCONTROLLER" at a band rate 2400, 8 bit data, 1 stop bit serially. **(08 Marks)**

8 a. Compare polling and interrupt. Explain the six interrupt of 8051, with priority and interrupt vector table. **(08 Marks)**

b. Write a C program that continuously gets a single bit of data from P1.7 and sends it to P1.0, while simultaneously creating a square wave of 200 μs period on P2.5. Use timer 0 to create the square wave. Assume XTAL = 11.0592 MHz. **(08 Marks)**

9 a. Briefly explain the control word of 8255 and specify the mode selection. **(06 Marks)**

b. Refer to the Fig.Q9(b), write a C program to monitor the status of SW and perform the following:

(i) If SW = 0, the DC motor moves with 50% duty cycle pulse.

(ii) If SW = 1, the DC motor moves with 25% duty cycle pulse.

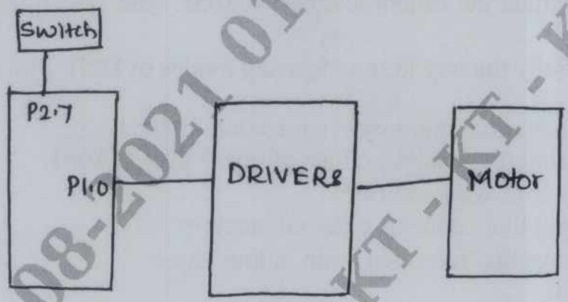

Fig.Q9(b) **(10 Marks)**

10 a. With necessary interface diagram, write a C program to generate a triangular wave using DAC interface. **(08 Marks)**

b. Refer to Fig.Q10(b) and write an 8051 program to send letters 'V', 'T', 'U' to the LCD using delays.

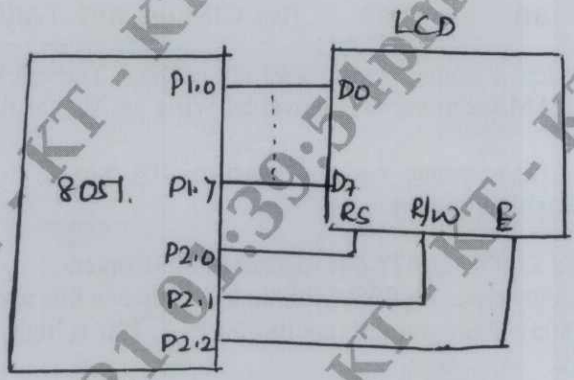

Fig.Q10(b) **(08 Marks)**

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15EE53

Fifth Semester B.E. Degree Examination, July/August 2021
Power Electronics

Time: 3 hrs. Max. Marks:80

Note: ***Answer any FIVE full questions.***

1 a. Mention and explain the different types of power electronic converter systems. Draw their i/p o/p waveforms. **(10 Marks)**

b. Explain the reverse recovery characteristics of diode. **(06 Marks)**

2 a. With circuit diagram and waveforms, explain the working of single phase full wave rectifiers. **(06 Marks)**

b. Explain freewheeling diode circuit with waveforms write related equations. **(06 Marks)**

c. Write a note on peripheral effects of power electronic circuits. **(04 Marks)**

3 a. Draw and explain the switching characteristics of power MOSFET. **(06 Marks)**

b. The bipolar transistor specified to have β in the range of 8 to 40. The load resistance R_C = 11Ω. The DC supply V_{CC} = 20V, the voltages $V_{CE(sat)}$ = 1.0V and $V_{BE(sat)}$ = 1.5V, V_B = 10V. Find :
i) The valve of R_B that results in saturation with an ODE of 5.
ii) The β forced and
iii) The power loss P_T. **(05 Marks)**

c. Explain base derive counter of BJT during turning on process. **(05 Marks)**

4 a. With neat waveforms and equations, explain the steady-state characteristics of BJT. **(06 Marks)**

b. Give the cross section equivalent circuit and transfer characteristics of IGBT. **(05 Marks)**

c. How isolation is achieved using pulse transformer and opto coupler. **(05 Marks)**

5 a. Derive an expression for the anode current of thyristor with help of two transistor model. **(08 Marks)**

b. Explain how thyristors are protected against high $\frac{dv}{dt}$. **(08 Marks)**

6 a. Explain the operation of a RC firing circuit with waveforms. **(08 Marks)**

b. Ten thyristors are used in a string to withstand a DC voltage of V_S = 15KV. The maximum leakage current and recovery charge differences of thyristors are 10mA and 150μC respectively. Each thyristor has a v/g sharing resistance of R = 56kΩ and capacitance of C_1 = 0.5μF. Determine :
i) Maximum steady state v/g $V_{os(max)}$
ii) Steady state voltage derating factor
iii) Maximum transient voltage sharing $V_{DT(max)}$
iv) The transient voltage derating factor. **(08 Marks)**

7 a. Explain the working of single phase full converter with resistive load. **(08 Marks)**

b. With the help of circuit diagram and waveforms explain the operation of bidirectional AC controller with R-load. **(08 Marks)**

8 a. With circuit diagram and waveforms explain the operation of 1ϕ AC counter with inductive load (RL load). **(08 Marks)**

b. Explain single phase dual converters. **(08 Marks)**

9 a. Explain the basic principle of step-down chopper and write the expressions for, i) average o/p voltage ii) output power. **(10 Marks)**

b. A chopper circuit is operating at a frequency of 2KHz on 460V supply of the load voltage of 350V. Calculate the conduction period of the thyristor in each cycle. **(06 Marks)**

10 a. Explain the working of class A, class B, class C and class D and class E choppers. **(10 Marks)**

b. A step up DC chopper has an input of 200V and an o/p of 250Volts. The blocking period in each cycle of operation is 0.6×10^{-3} sec. Find the period of conduction in each cycle. **(06 Marks)**

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15EE54

Fifth Semester B.E. Degree Examination, July/August 2021
Signals and Systems

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions.***

1 a. Explain the signals and systems with the help of examples. **(05 Marks)**

b. Determine whether the following signals are periodic or not? If periodic determine fundamental period. i) $\text{Cos}t + \text{Sin}\sqrt{2}\,t$ ii) $\text{Cos}\frac{2\pi n}{5} + \text{Cos}\frac{2\pi n}{7}$. **(05 Marks)**

c. A signal x(t) = u(t), unit step function. Sketch and lable each of the following signals.
i) $x(t-2)$ ii) $x(2t-2)$ iii) $x(t/2-2)$. **(06 Marks)**

2 a. Determine whether the system is linear, time invariant, stable and causal.
i) $y(n) = \log[x(n)]$ ii) $y(t) = 10x(t) + 5$. **(06 Marks)**

b. Determine the even and odd component of the following signal $x(n) = 2,\ 0 \le n \le 3$. **(05 Marks)**

c. Determine whether the following signals are energy signals or power signals and calculate their energy or power

i) $x(n) = \left(\frac{1}{2}\right)^n u(n)$ ii) $x(t) = At \quad 0 \le t \le T$. **(05 Marks)**

3 a. The impulse response and the input to the system is given as
$h(t) = u(t-2)$ and $x(t) = u(t+1)$. Determine the output of the system. **(07 Marks)**

b. Find the total response of the system described by the system,

$y(n) - \frac{1}{4}y(n-1) - \frac{1}{8}y(n-2) = x(n) + x(n-1)$, given that

$x(n) = 2^n u(n) \cdot y(-1) = 2,\ y(-2) = -1$. **(09 Marks)**

4 a. Determine the convolution of two given sequences. $x(n) = \left[\begin{matrix}1, 2, 3, 4\\ \ \ \uparrow\end{matrix}\right]$ and $h(n) = \left[\begin{matrix}1, 1, 3, 2\\ \uparrow\end{matrix}\right]$. **(04 Marks)**

b. Determine the natural response of the system described by the differential equation

$10\frac{dy(t)}{dt} + 2y(t) = x(t)$ with $y(0) = 2$. **(06 Marks)**

c. A difference equation of a discrete time system is given below :

$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$. Draw direct form – I and direct form – II structures. **(06 Marks)**

5 a. State and prove the following properties of continuous time Fourier transform.
i) Time shift property ii) Convolution in time. **(07 Marks)**

b. Obtain the Fourier transforms of following signals.
i) $x(t) = e^{at}u(-t)$ ii) $x(t) = e^{-a|t|}$ iii) $x(t) = \delta(t)$. **(09 Marks)**

6 a. The input and the output of a causal LTI system are related by differential equation $\frac{d^2y(t)}{dt^2}+6\frac{dy(t)}{dt}+8y(t)=2x(t)$. Find the impulse response of this system. **(07 Marks)**

b. A continuous, casual linear time invariant system is shown in Fig Q6(b). Determine the unit impulse of this system. Plot the response [step response].

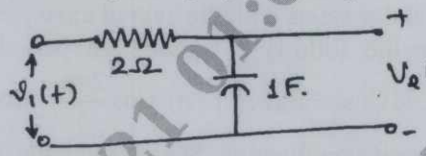

Fig Q6(b) **(09 Marks)**

7 a. Determine DT Fourier transform of
i) $x(n)=a^n u(n)$ for $-1<a<1$ ii) $x(n)=\delta(n)$ iii) $x(n)=-a^n u(-n-1)$ **(08 Marks)**

b. State and prove the following properties of DTFT, i) Frequency shift ii) Parseval's theorem. **(08 Marks)**

8 a. Determine the time domain signal
$$x(e^{j\Omega})=\frac{6}{e^{-j2\Omega}-5e^{-j\Omega}+6}$$ **(06 Marks)**

b. A discrete time system has a unit sample response h(n) given by
$h(n)=\frac{1}{2}\delta(n)+\delta(n-1)+\frac{1}{2}\delta(n-2)$. Find the system frequency response $H(e^{j\Omega})$. Plot the magnitude and phase response. **(06 Marks)**

c. An LTI system is described by $H(f)=\frac{4}{2+j2\pi f}$. find its response y(t) if the input is $x(t)=u(t)$. **(04 Marks)**

9 a. List the properties of ROC. **(05 Marks)**

b. Determine the Z-transform of
i) $x(n)=a^n\cdot\cos[\Omega_0 n]\cdot u(n)$ ii) $x(n)=n\left(\frac{5}{8}\right)^n u(n)$. **(05 Marks)**

c. State and prove the initial value theorem and final value theorem. **(06 Marks)**

10 a. Find the inverse Z-transform of x(z) using partial fraction expansion approach.
$$x(z)=\frac{z+1}{3z^2-4z+1}\quad \text{ROC}:|z|>1.$$ **(07 Marks)**

b. Using unilateral Z-transform, solve the following difference equation. **(07 Marks)**
$y(n)+3y(n-1)=x(n)$ with $x(n)=u(n)$ and the initial condition $y(-1)=1$.

c. Explain the causality and stability interms of Z-transform. **(02 Marks)**

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15EE563

Fifth Semester B.E. Degree Examination, July/August 2021
Renewable Energy Sources

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions.***

1 a. Classify different energy resources. **(07 Marks)**

b. Define:
i) Solar constant
ii) Latitude angle
iii) Hour angle
iv) Declination angle
v) Altitude angle. **(05 Marks)**

c. Calculate the hour angle at sunrise and sunset on June 21 and December 21 for a surface inclined at an angle of 10° and facing due south (r = 0°). The surface is located in Mumbai (19°07'N, 72°51' E). **(04 Marks)**

2 a. Explain World energy scenario. **(06 Marks)**

b. Explain different layers of the sun. **(06 Marks)**

c. Calculate zenith angle of the sun at Lucknow (26.75ON) at 9:30AM on February 16, 2012. **(04 Marks)**

3 a. Explain working of stirling or Brayton heat engine. **(06 Marks)**

b. With a net schematic diagram, explain solar collector systems into building services. **(05 Marks)**

c. A certain 120V, 60Hz AC motor is to be powered by solar cell array during the day and at night, by a 120V public utility. A DC to AC converter is available that changes the array DC output in to a 120V, 60Hz AC with 90% efficiency independent of load phase angle, while running motor has DC resistance of 300Ω and an inductance of 0.3H. How much of power output must the array provide? **(05 Marks)**

4 a. Explain working of solar cookers. **(06 Marks)**

b. Explain I-V characteristics of solar cells. **(06 Marks)**

c. Mention different applications of solar cell systems. **(04 Marks)**

5 a. Explain various electrolytic hydrogen production technologies. **(06 Marks)**

b. Explain site selection for wind energy systems. **(05 Marks)**

c. Discuss various methods of geothermal resource exploration. **(05 Marks)**

6 a. Explain the working of dry steam based geothermal power plants. **(06 Marks)**

b. What are the advantages and disadvantages of waste recycling? **(05 Marks)**

c. With a block diagram, explain waste recovery management scheme. **(05 Marks)**

7 a. With the help of neat diagram and chemical reactions. Explain working of UP draft gasification. **(07 Marks)**
b. With a block diagram, explain various stages in Anaerobic digestion. **(06 Marks)**
c. Mention advantages and disadvantages of Tidal power. **(03 Marks)**

8 a. Explain biogas production techniques with a neat diagram. **(08 Marks)**
b. Explain double basin type tidal power generation. **(08 Marks)**

9 a. Derive expression for power associated with sea waves. **(06 Marks)**
b. Explain open cycle ocean thermal energy conversion system. **(06 Marks)**
c. A 2m sea wave has a 6 second period and occurs at the surface of 100m deep water. Assume sea water density equals to $1025 kg/m^3$. Calculate the energy and power densities of the wave. **(04 Marks)**

10 a. Explain hybrid cycle system in ocean thermal power generation. **(08 Marks)**
b. Explain the following devices for harnessing wave energy.
i) Salter's Duck system
ii) Archimedes wave swing devices. **(08 Marks)**

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