

QP Code : 6311

(3 Hours)

[Total Marks : 80]

NB. Q.1 is Compulsory.

Solve any three questions from the remaining

Q1

20

- Explain SCR characteristics
- Write advantages of IGBT and MOSFET
- Explain need of synchronizing circuit in converters
- Draw the circuit of Jones Chopper and explain the commutation of main SCR

Q2.

20

Design a converter to give output voltage 150 V at 1A load current. The input is 230 V 50 Hz ac supply. Use UJT 2N2646.

$V_{BBmax} = 35 \text{ V}$  for  $V_{bb} = 16 \text{ V}$ ,  $C = 0.1 \mu\text{F}$ ,  $\alpha_{min} = 0.56$ ,  $\alpha_{max} = 0.75$ ,  $\eta_{type} = 0.63$

$I_v = 4 \text{ mA}$ ,  $I_p = 25 \mu\text{A}$  Consider temperature compensation.

Q3 a) with the help of a neat diagram and associated waveforms discuss the operation of Buck-Boost converter. Also list the advantages and disadvantages of this type of converter.

b) Explain variable frequency I.M. drive.

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Q4

a) Describe the working of 1phase fully controlled bridge converter in the following two modes.

Rectifying mode

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Inversion mode.

Also sketch the following waveforms for  $\alpha = 45^\circ$  &  $\alpha = 120^\circ$

b) Write a short note on reduction of harmonic distortion.

5

c) Briefly explain the V-I characteristic of IGBT.

5

Q5

a) Explain the application of power electronics in industrial heating process.

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b) A 1-phase HW ac regulator feeds power to resistive load of  $6\Omega$ , from 230 V, 50 Hz source.

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The firing angle of SCR is  $\pi/2$ . Calculate

1) The rms value of output voltage

2) average input current.

Q6

Explain the current fed ac drives & state its applications

10

State the significant features of traction drives

05

Explain any one type of forced commutation

05

(3 Hours)

[Total Marks : 80]

- 3 : (1) Question No.1 is Compulsory.  
 (2) Attempt any Three questions from the remaining five questions.  
 (3) Assume suitable data if necessary.

Answer the following (Any Four) :

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- (a) State and prove the convolution property of z-transform.  
 (b) Draw the single butterfly of 2 - Radix DIT & DIF FFT algorithm.  
 (c) State and prove the complex conjugate property of DFT.  
 (d) The transfer function of analog filter is  $H(S) = \frac{S+2}{(S+1)(S+3)}$  design a digital IIR filters by means of IIT. Assume  $T = 0.1$  Sec.  
 (e) Determine IDFT of  $x(k) = [6, -1-j, 0, 1+j]$  by using DIT FFT algorithm.

- (a) If  $x_1(n) = [1, 2, 0, 3]$  and  $x_2(n) = [1, 2, 3, 2]$ . Find the DFT of both the sequence by using DFT only once (not otherwise). 10  
 (b) Derive and draw the FFT for  $N = 6 = 2 \cdot 3$  using DIT FFT algorithm. 10  
 (a) If  $x_1(n) = [1, 2, 3, 5]$  and  $x_2(n) = [2, 4, 2, 3]$ . Obtain  $x_1(n) \otimes x_2(n)$  by using DIF FFT algorithm. 10  
 (b) Prove the relation between the analog and digital filter by means of Bilinear Transformation Technique. 10  
 (a) Determine the output of a Linear FIR Filter whose impulse response  $h(n) = \{3, 2, 1\}$   $x(n) = [1, 0, 2, 1, 0, -2, -1, 0, 3, 1]$  using over lap add method. 10  
 (b) Determine the frequency response of the system  $h(n) = a^n u(n)$  magnitude and phase response of it. 10  
 (a)  $y(n) = x(n) + \frac{1}{4} x(n-1) + \frac{1}{6} y(n-1) + \frac{1}{6} (1-z)$  Realize the system by using Direct form - 1 cascade and parallel form realization. 10  
 (b) Design a digital Butterworth filter that satisfy the following constraint using Bilinear Transformation. Assume  $T = 1$  Sec 10

$$0.9 \leq |H(e^{j\omega})| \leq 1 \quad 0 \leq \omega \leq \pi/2$$

$$|H(e^{j\omega})| \leq 0.2 \quad 3\pi/4 \leq \omega \leq \pi$$

TURN OVER

- (a) A pass filter is to be designed which has the following frequency response

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$$H_d(e^{j\omega}) = e^{-j3\omega} \quad -\frac{3\pi}{4} \leq \omega \leq \frac{3\pi}{4}$$

$$\frac{3\pi}{4} \leq |\omega| \leq \pi$$

Determine the filter coefficient  $h(n)$  by using Hamming window.

- (b) A one state decimator is characterised by the following decimator factor = 3

10

Antialiasing filter coefficient

$$h(0) = -0.06 = h(4)$$

$$h(1) = 0.30 = h(3)$$

$$h(2) = 0.62$$

Given the data  $x(n)$  with a successive [6, -2, -3, 8, 6, 4, -2]. Calculate and list filtered output  $w(n)$  and the output of the decimator  $y(n)$ .



Q.P. Code : 6396

(3 Hours)

[ Total Marks : 80

- N.B. :** (1) Question No. 1 is compulsory.  
 (2) Attempt any **three** questions from question no. 2 to 6.  
 (3) Assume suitable data if necessary.

1. (a) Define embedded systems. Give examples of embedded systems. What are the types of embedded systems. 5  
 (b) Interface and LED to PIC18F microcontroller. Explain interfacing circuit. Write a program to blink LED at regular interval. 5  
 (c) List the features of PIC18F microcontroller. 5  
 (d) Explain priority inversion with suitable example. 5
2. (a) Explain Port A pin structure of PIC18F microcontroller. Write a program to configure port A & B as input and Port C and D as output. 10  
 (b) Write a program to convert 8 bit binary no. to BCD. 10
3. (a) Explain PIC18F serial port in brief. Write a program to transmit "INSTRU" serially at 9600 bits per second. Assume suitable clock frequency. 10  
 (b) Interface 16 x 2 LCD module to PIC18F MCU. explain the same. Write a program to display "INSTRUMENTATION" on first line & "ENGINEERING" on second line. 10
4. (a) Interface four 7-segment displays to PIC18F MCU. Write a program to display "1234" on it. 10  
 (b) What is task scheduling in RTOS ? Explain various task scheduling algorithms. 10
5. (a) Explain on-chip ADC module of PIC18F MCU. Write a program to Read channel no.0 and display it on port B(lower byte) and port C (HB). 10  
 (b) Write a program to generate 100 Hz square wave using timer on RBO pin. Assume clock frequency is 16MHz. 10
6. (a) Explain design challenges of Embedded system. 10  
 (b) Write a short note on (any two) 10
  - (i) I<sup>2</sup>C communication protocol
  - (ii) Explain instruction
    - (a) BCF (b) ANDLW
  - (iii) Interrupt latency