

Seat Number

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**ELECTIVE - II**  
**Embedded System**  
**(1311)**

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Attempt **any two** sub questions from each unit.
5. Figures to the right indicate full marks.

**UNIT - I**

1. a) Explain different characteristics of embedded system. 10
- b) Explain SPI and I<sup>2</sup>C Bus protocol. 10
- c) What is design metric and market window. Discuss why it is important for product to reach the market early in this window. 10

**UNIT - II**

2. a) i) Explain three stage pipeline of ARM processor. 5
- ii) Explain the role of Barrel shifter in ARM-7. 5
- b) Explain with code ARM-Thumb interworking. 10
- c) List and explain various exception of ARM-7 processor. 10

**UNIT – III**

3. a) List and explain various AT commands of GSM modem. 10
- b) Explain interfacing of 8 DIP switches and 8 LEDs with ARM-7 processor and write an embedded C-program for reading switch position and displaying it on LEDs. 10
- c) Explain interfacing of Thermal printer with ARM processor and write an embedded C-program to print a character on it. 10

**UNIT - IV**

4. a) Explain the operation of event control block in VCOs-II. 10
- b) What do you mean by context switching and list various scheduling algorithm, Explain any one. 10
- c) Explain the priority inversion problem and how to overcome it. 10

**UNIT - V**

5. a) Explain patching and different problems associated with it. 10
- b) Draw and explain the architecture of Linux file system. 10
- c) Draw and explain the basic architecture of a flash system. 10

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Seat Number

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**ELECTIVE - II**  
**Digital Image Processing**  
**(1312)**

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Figures to the right indicate full marks.
5. Draw figure whenever necessary.

**UNIT - I**

1. Solve any two

- a) Why image transformation is needed? Explain various types of image transforms. 10
- b) State the components image processing system. Explain in detail. 10
- c) Explain spatial and gray level resolution. 10

**UNIT - II**

2. Solve any two

- a) Give mathematical expression for ideal, Butterworth and Gaussian Filter. Also explain their role in image enhancement. 10
- b) Suggest a suitable filter that will reduce the impact of Gaussian noise. Justify your answer 10
- c) Explain image enhancement using histogram processing. 10

## UNIT - III

3. Solve any two.

- a) Explain Arithmetic and RLC coding technique. 10
- b) Discuss three basic data redundancies in DIP. 10
- c) Explain in detail JPEG baseline coder decoder. 10

## UNIT - IV

4. Solve any two

- a) Explain various noise models. 10
- b) Write a note on pseudo coloring. 10
- c) Explain RGB to HIS conversion. 10

## UNIT - V

5. Solve any two

- a) Explain region based image segmentation. 10
- b) Explain Edge detection using Sobel and Prewitt operators. 10
- c) Explain Image representation using chain codes and signature. 10

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Seat Number

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**ELECTIVE - I**  
**Biomedical Instrumentation**  
**(1252)**

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Every questions carry equal marks.
6. Draw Figures whenever necessary.

**UNIT - I**

1. Solve **any two**.

- a) With the help of diagrams, explain principles of NMR imaging systems. 10
- b) Draw and explain the basic pulse echo-Apparatus. 10
- c) Write note on Medical thermography. 10

**UNIT - II**

2. Solve **any two**.

- a) Write short note on Defibrillators. 10
- b) Write short note on coulter counter. 10
- c) What is need of pacemakers? Explain ventricular synchronous demand pacemaker in detail. 10

**UNIT - III****3. Solve any two.**

- a) Write short note on microwave diathermy machine. 10
- b) Explain the principles of operations of LASER. 10
- c) Draw block diagram of ultrasonic therapy unit. Explain it in detail. 10

**UNIT - IV****4. Solve any two.**

- a) With the help of diagram explain function of kidney. 10
- b) Draw the diagram & explain the principle of dialysis in the artificial kidney. 10
- c) Explain working of modern ventilators. 10

**UNIT - V****5. Solve any two.**

- a) In ECG telemetry system, explain working of transmitter & receiver. 10
- b) Draw and explain the implantable blood flowmeter. 10
- c) What is spectro-photometry? Explain it in detail. 10

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Seat Number

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**ELECTIVE - I**  
**VLSI Design**  
**(1251 / 1254)**

**P. Pages : 2****Time : Three Hours****Max. Marks : 100**

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Figures to the right indicate full marks.
5. Assume data wherever necessary.
6. Please mark question number with specific bit to write answer.

**UNIT - I****1. Solve any two.**

- |    |  |    |
|----|--|----|
| a) | Define entity and architecture of VHDL module. Give the syntax rule with suitable example. | 10 |
| b) | Draw and explain the programmable logic design flow in detail.                             | 10 |
| c) | Write the verilog codes for 2:4 decoder using data flow description.                       | 10 |

**UNIT - II****2. Solve any two.**

- |    |  |    |
|----|--|----|
| a) | Write VHDL codes for BCD to 7 segment display circuit using data flow description. | 10 |
| b) | Write VHDL codes for J-K flip-flop using behavioral description.                   | 10 |
| c) | Explain the procedure & function statements with suitable examples.                | 10 |

## UNIT - III

## 3. Solve any two.

- a) Write VHDL codes for 4-bit full adder using structural description. 10
- b) Write the VHDL codes for following logic using switch level description. 10
- $$y = \overline{(a+b)} \cdot (c+d)$$
- c) Write the VHDL codes for AND gate with strong output using switch level description. 10

## UNIT - IV

## 4. Solve any two.

- a) Write the VHDL codes for 1-bit full adder using mixed type description. 10
- b) 10

21	3	12
11	8	

myfile.txt

For myfile.txt multiply first integer by 5, second by 4, third by 3, forth by 2 and fifth by 6. The products are store in the integers Z1, Z2, Z3,Z4 and Z5 respectively. Write the VHDL codes, using file processing.

- c) What is package? Give the syntax rule for package with suitable example. 10

## UNIT V

## 5. Solve any two.

- a) Draw and explain the product term allocator for CPLD 9500. 10
- b) Discuss the boundary scan test. 10
- c) What is simulation? Explain the different steps of simulation. 10

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Seat Number

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## Computer Communication Networks (1240)

P. Pages : 2

Time: Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** sub questions from each unit.
5. Assume suitable data, if necessary.
6. Use of non-programmable calculator is allowed.

### UNIT - I

1.
  - a) What are the different applications & technologies of infra red and light wave transmission? 10
  - b) Explain in brief the concept of virtual switching with respective to broadband ISDN. 10
  - c) Write a short note on. 10
    - i) ATM switches
    - ii) Internet over cable.

### UNIT - II

2.
  - a) Explain Go-back-n and selective repeat protocols 10
  - b) Compare the data link layers between HDLC, Internet and ATM 10
  - c) What are the different wireless lan protocols? Explain any standard in details. 10

## UNIT – III

3. a) Enlist all the design issue in Internet organization. 10
- b) Explain the concept of hierarchical routing with its significances. 10
- c) How control of congestion control takes place in virtual circuits subnets? Explain. 10

## UNIT – IV

4. a) Explain expansion headers in IPv6 Packet format over IPv4 packet. 10
- b) Explain how switching and routing takes place in ATM network. 10
- c) Explain the structure of ATM LAN in details. 10

## UNIT – V

5. a) How reliable network is maintained wing TCP? Explain with suitable flow diagram. 10
- b) Draw and explain TCP Packet format. 10
- c) Explain structure and features of ATM AAL protocol. 10

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## Digital Signal Processing & Processors

(1230)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carries equal marks.
5. Assume suitable data if required.
6. Use of non-programmable calculators are allowed.

### UNIT – I

1. Solve any two :

20

- a) What is aliasing effect? How aliasing can be prevented while sampling a continuous time signal.  
If a system is represented by the following difference equation:  
$$y(n) = 3y^2(n-1) - nx(n) + 4x(n+1) - x(n+1), n \geq 0$$
  - a) Is the system Linear? Explain
  - b) Is the system shift invariant? Explain
  - c) Is the system causal? Explain.
- b) What are the advantages and limitation of analog signal processing over digital signal processing.
- c) What do you mean by correlation of the signal? Explain auto-correlation and cross correlation in details.

### UNIT – II

2. Solve any two :

20

- a) Find the Z transform of the following :  
$$x(n) = \cos n\theta u(n)$$
  
comment on region of convergence.

- b) Obtain the inverse Z transform for :

$$x(z) = \frac{1}{(1+z^{-1})(1-z^{-1})^2}$$

- c) Find  $x(n)$  if  $x(z) = \frac{z(1-e^{-T})}{(z-1)(z-e^{-T})}$

**UNIT - III**

3. Solve any two :

- a) Perform the circular convolution of the following two sequences using DFT & IDFT method

$$x(n) = \{1, 1, 2, 1\}$$

$$y(n) = \{1, 2, 3, 4\}$$

- b) Find the IDFT of the sequence :

$$x(k) = \{4, (1-J 2.414), 0, (1-J 0.414), 0, (1+J 0.414), 0, (1+J 2.414)\}$$

using DIF algorithm.

- c) Obtain the DFT for the sequence given below :

$$x(n) = \{1, 1, 2, 2, 3, 3\}$$

Also compute the corresponding amplitude and phase response.

**UNIT - IV**

4. Solve any two :

20

- a) Develop cascade and parallel realisation structures for :

$$H(z) = \frac{\frac{z}{6} + \frac{5}{24} + \frac{5}{24}z^{-1} + \frac{1}{24}z^{-2}}{1 - \frac{1}{2}z^{-1} + \frac{1}{4}z^{-2}}$$

- b) Design a digital butter worth filter that satisfies the following constraints using bilinear transformation. Assume  $T = 1$  sec.

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

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

c) Design a FIR filter with

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

$$= 0 \quad \frac{\pi}{4} < |\omega| \leq \pi$$

using a Hamming window with  $N = 7$ .

### UNIT – V

5. Solve any two.

20

- Explain in details, different types of addressing modes in a dsp processor.
- Classify the different applications of a dsp processor. Explain any one in details.
- Classify the different types of dsp processors.
  - What is pipelining. Explain in details.

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## Fiber Optic Communication

(1220)

P. Pages : 4

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carries equal marks.
5. Assume suitable data if necessary.
6. Use of non programmable calculator is allowed.

### UNIT – I

1. Solve any two.

20

- a) What is mode, referred to the propagation of light through fiber, what are the types of modes which may exist during propagation ?  
A graded index fiber with a parabolic index profile supports the propagation of 742 guided modes. The fiber has numerical aperture in air of 0.3 and core diameter of 70  $\mu\text{m}$ . Determine :
  - i) wavelength of propagation.
  - ii) Maximum diameter of fiber, which gives a single mode propagation at same wavelength.
- b) What is wave theory of light & define the relative refractive index difference for optical fiber and show how it may be related with numerical aperture ? A step index fiber have an acceptance angle of  $22^\circ$  & relative refractive index difference of 3% estimate the N.A. & critical angle at core-cladding interface.
- c) Write notes on :
  - i) Fiber splices.
  - ii) Directional coupler.

## UNIT – II

2. Solve any two.

20

a) For LED as light source used in fiber communication have

internal quantum efficiency  $\eta_{int}$ , prove that  $\eta_{int} = \frac{z}{z_r}$ , where  $z \rightarrow$  total recombination life time, and  $z_r \rightarrow$  radiative minority carrier life time.

List mainly used materials for the fabrication of LED in OFC ?

b) Explain main factors which limits the speed of response of photodiode ?

A photo detector in fig. 1 has following output current waveform, when a step function of input power is applied.

$$i = 10 \left[ 1 - e^{-t/z} \right] \text{ where } z = 10^{-6} \text{ sec}$$

Calculate detectors 3dB bandwidth ?

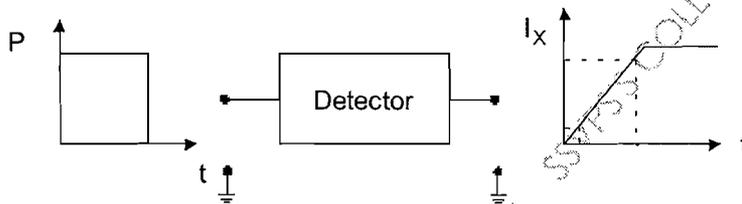


Fig. 1

c) Explain why -

- $I - V$  converter is necessary with photodiode, used as a detector.
- Surface emitting LED (surface emitters) are usually used with larger N.A. fiber.
- Distributed feedback laser diodes are the first choice as light source in OFC.



## UNIT – IV

4. Solve any two.

20

- a) Write notes on :
- Bending losses.
  - Absorption losses.
- b) Define signal to noise ratio and explain various types of noise occurs in optical fiber system also define NEP ?
- c) The optic power reaching the receiver is  $1 \mu\text{w}$ . The detectors responsivity is  $0.5 \text{ A/w}$ , and its dark current is  $4 \text{ nA}$ . The temp. is  $27^\circ\text{C}$  & receivers bandwidth is  $500 \text{ MHz}$  and  $R_L = 50 \Omega$ . Calculate :
- The signal to noise ratio.
  - Thermal noise limited SNR.
  - Shot – noise limited SNR.

## UNIT – V

5. Solve any two.

20

- a) Notes :
- SONET.
  - Optical sensors.
- b) Notes :
- Optical filters.
  - Integrated optics.
- c) With help of diagram, explain working of WDM in fiber communication ? What is DWDM ?

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## Power Electronics - II (1290)

P. Pages : 3

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

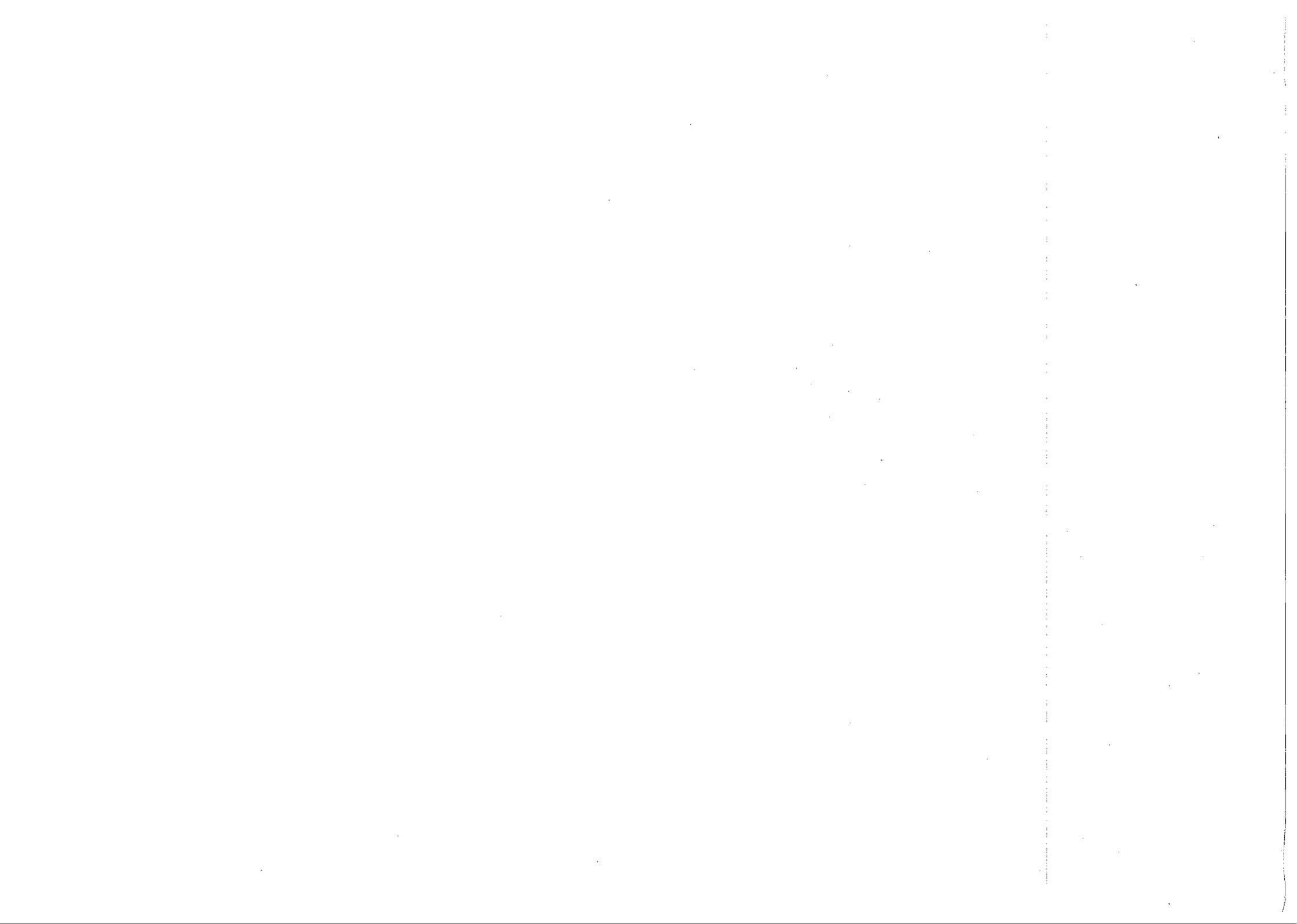
1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Attempt **any two** from each question.
6. Assume suitable data if necessary.
7. Use of non-programmable calculator is allowed.
8. Draw neat diagrams wherever necessary.

1. a) Derive the relation for maximum peak to peak ripple in the armature current  $I_a$  for unipolar and bipolar PWM switching schemes ? Draw relevant graphs and waveforms ? 10
- b) A 3- $\phi$  semiconverter, operating from 3- $\phi$ , 440 volts, 50 Hz supply, is used to control speed of 100-HP, 600 volts, 1500 rpm, separately excited motor ? For the motor  $I_{rated} = 135A$ ,  $R_a = 0.05 \Omega$ , and  $K_{a\phi} = 0.4$  volts/rpm. Calculate : 10
  - i) No load speed at  $\alpha = 50^\circ$  for  $I_{a, no load} = 12$  amps.
  - ii) Value of  $\alpha$  to achieve rated speed at rated current.
  - iii) The power factor and torque developed at rated condition ?
- c) i) With the help of block diagram explain working of servo drive with inner current loop ? 5

- ii) Explain the limitation of line frequency controlled a.c. to d.c. converter for two quadrant operation ? Explain how four quadrant operation is possible with the help of contactors ? 5
2. a) A 5 H.P., 440 volts, 60 Hz, four pole I.M. supplies its rated output at 1746 rpm. Calculate speed, slip and slip frequency when the motor is supplied at 220 volts, 30 Hz. Assume, 10
- i) Load torque to be proportional to speed &
- ii) Centrifugal load.
- Also calculate  $f_{st}$  if  $T_{st}$  is 150% of  $T_{fl}$  ?
- b) Explain induction motor capabilities below and above rated speed? Draw graph and explain constant torque region, constant power region and constant  $f_{sl}$  region ? 10
- c) Explain speed control of phase wound Induction motor by slip power recovery scheme ? 10
3. a) Draw the circuit diagram and explain in detail the thyristor drive circuit for bridge type converters ? 10
- b) What do you mean by the terms blanking time and dead time ? What is their significance ? Draw circuit diagram and waveforms and explain how the provision for blanking time is made ? 10
- c) Explain the different circuit layout considerations and methods to minimise stray inductance in drive circuits ? 10
4. a) What is a snubber circuit ? State the different functions carried out by a snubber circuit ? What are the types of snubber circuit ? Draw the basic snubber circuit with respect to thyristor converters ? Explain the procedure to find values of  $C_{base}$ ,  $C_s$  and  $R_s$  ? 10
- b) Draw a neat circuit diagram and explain operation of over voltage snubber for transistor converters ? Derive relation for  $C_{ov}$  and  $C_{si}$ ? 10

- c) A 400V, 60A, thyristor converter operating at rated load has on state power loss of 150 watts. The thermal resistances are  $R_{\theta jc} = 0.02^\circ\text{C}/\text{w}$ ,  $R_{\theta cs} = 0.09^\circ\text{C}/\text{w}$  and  $R_{\theta SA} = 0.09^\circ\text{C}/\text{w}$ . Draw the thermal equivalent circuit and calculate and show on it, the temperature of sink, case and junction, if ambient temperature is  $40^\circ\text{C}$ ? If additional switching loss of  $1.1 \times 10^{-3} f_s$  watts is considered, calculate maximum allowable switching frequency for  $T_{j\text{max}} = 75^\circ\text{C}$ . 10
5. a) State and explain basic types of static VAR control? Explain operation of thyristor switched capacitors? 10
- b) Explain what do you mean by utility interface? Explain the need for improved utility interface and the different methods used for it? 10
- c) Write short note on use of power electronics in HVDC system? 10

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## Digital Communication Systems (1280)

P. Pages : 2

Time: Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Assume suitable data, if necessary, giving reasons.

### UNIT – I

1. Attempt **any two**.

10

a) Define

- i) Continuous random Variable
- ii) Random process.
- iii) Time & ensemble average of random variable.
- iv) Stationary & ergodic random processes.
- v) Probability density function of a random variables. With suitable illustration.

b) Define the Fourier transform for periodic signals &amp; explain its significance.

10

c) State &amp; prove following properties of Fourier transform.

10

- i) Multiplication in time domain.
- ii) Differentiation in time domain.

## UNIT –II

2. Attempt any two.

- a) Distinguish between instantaneous sampling, Natural sampling, flat top sampling with functional block diagram. Explain the working of a circuit that provides flat top sampling. 10
- b) Explain with block schematic Linear predictive coder and decoder. States its advantages and disadvantages over other voice encoding method. 10
- c) Derive the expression for quantization noise and signal to noise ratio for PCM. Explain how companding improves signal to noise ratio? 10

## UNIT – III

3. Attempt any two.

- a) Explain scramblers and descramblers. 10
- b) Derive the equation for signal to noise ratio for integrator and dump receivers? Comments about signal to noise ratio. 10
- c) Discuss different Line codes used in digital communication. Give the spectral characteristics of each. 10

## UNIT – IV

4. Attempt any two.

- a) Discuss with block diagram and phasor diagram M-ary PSK. 10
- b) Explain working of BFSK Transmitter and receiver. Show signal space representation of the orthogonal and non orthogonal BFSK signals. 10
- c) With the help of block diagram schematic explain the principle of CDMA encoding and decoding Technique, Compare the same with FDMA and TDMA. 10

## UNIT – V

5. Attempt any two.

- a) Discuss in detail shannon- Hartley Theorem. 10
- b) What are the function of parity check matrix and Generator matrix in Linear block codes? How they are used to generate code vectors from message blocks ? 10
- c) Explain FEC and ARQ system of error control 10

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## Process Instrumentation (1300)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. Solve **any two** questions from each unit.
5. Assume suitable data if required.
6. Draw diagrams wherever necessary.

### UNIT – I

- |    |  |    |
|----|--|----|
| 1. | Draw & explain the working of spring less pneumatic actuators with positioner.                               | 10 |
| 2. | Explain the control system evaluation. Enlist the parameters on which system is evaluated along with graphs. | 10 |
| 3. | Draw circuits & explain v/f & f/v converter.   | 10 |

### UNIT – II

- |    |   |    |
|----|---|----|
| 4. | Draw & explain the characteristics of control valves.   | 10 |
| 5. | Explain the sliding stem type control valves & draw figures of any two such structures.                             | 10 |
| 6. | Draw & explain the working of multiposition mode of controllers which are the other modes of controllers you know ? | 10 |

## UNIT – III

7. An integral controller is used for speed control with a set point of 12 rpm within a range of 10 to 15rpm. The controller o/p is 22% initially. The constant  $K_I = - 0.15\%$  controller output per second per percentage error. If the speed jumps to 13.5 rpm calculate the controller output after 2 sec for a constant  $e_p$ . **10**
8. Draw & Explain the working of PID pneumatic controller. **10**
9. Suggest controller for given case,  
i) The error is changing in time  
ii) Rate of change of error. **10**

Explain working of the controller in detail.

## UNIT – IV

10. Explain the comparative account on open loop & closed loop systems. Give example in each case. **10**
11. Draw & explain the following. **10**  
i) Anti reset control.  
ii) Multivariable control
12. Draw the instrumentation schemes for boiler. **10**

## UNIT - V

13. Explain the working of SCADA in detail. **10**
14. Explain with the help of a diagram the working of distributed control system. Also list the advantages of the same. **10**
15. How is computer used for direct digital control ? Explain the same in detail. **10**

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## Power Electronics - I (1210)

P. Pages : 2

Time : Three Hours

Max. Marks : 100

Instructions to Candidates :

1. Do not write anything on question paper except Seat No.
2. Answer sheet should be written with black ink only. Graph or diagram should be drawn with the same pen being used for writing paper or black HB pencil.
3. Students should note, no supplement will be provided.
4. All questions are compulsory and carry equal marks.
5. Assume suitable data if necessary.
6. Use of non-programmable calculator is allowed.

1. Attempt **any two**.

- a) Draw and explain two transistor analogy of SCR with neat circuit diagram. 10
- b) Explain basic structure and V-I characteristic of MOSFET. 10
- c) Explain Structure and V-I characteristics of FCT. 10

2. Attempt **any two**.

- a) Draw and explain circuit diagram and waveforms for 1- $\phi$  full converter with R-L load and derive expression for average output voltage. 10
- b) Explain the working of 3- $\phi$  semi-converter with R-load and also draw waveforms for phase and line voltage at  $\alpha=60^\circ, 90^\circ$  and  $120^\circ$ . 10
- c) A 3- $\phi$  full converter operated from 3- $\phi$  having 208 V, 60 Hz supply with  $R_L=10\Omega$ . 10  
It is required to obtain 50% of the maximum possible output voltage. Calculate,
  - i) Delay angle  $\alpha$ .
  - ii) RMS and average voltage.
  - iii) RMS and average current.

## 3. Attempt any two.

- a) Explain the principle of step –up converter with the help of circuit diagram and derive the expression for load current at boundary condition between continuous conduction and discontinuous condition mode. 10
- b) In step down converter all components to be ideal. Let  $v_0=V_0$  be constant at 5v by controlling the switch duty ratio D. Calculate minimum inductance L required to keep the converter operation in the Continuous conduction mode under all condition if  $V_d$  is 10 to 40V,  $P_o = 5w$  &  $f_s = 50$  kHz. 10
- c) Draw and explain block diagram of SMPS in detail. 10

## 4. Attempt any two.

- a) Explain square wave switching of 1- $\phi$  half bridge inverter with resistive load. Also derive expression for peak voltage and peak current. 10
- b) What is necessity of UPS. Explain the different types with the help of neat block diagram. 10
- c) Explain the working of 3- $\phi$  square wave VSI for 180° conduction mode. Also draw it's output phase and line voltage waveforms. 10

## 5. Attempt any two.

- a) Explain ZCS resonant switch converter with neat circuit diagram and waveforms. 10
- b) Explain the PLR dc-dc converter half bridge circuit for a continuous mode of operation. 10
- c) Explain a class E converter with neat circuit diagram and waveforms for optimum and non-optimum mode. Give it's advantages and disadvantages. 10

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