

QP Code : 15827**(3 Hours)****[Total Marks : 100**

N.B.:

- (1) Question No.1 is compulsory.
- (2) Attempt any four questions out of remaining six questions.
- (3) Assume suitable data wherever required.

- Q1. a) How robots are classified? **5 marks**
 b) Explain basic four steps for transferring Frame k-1 to frame k and write general transformation matrix **5 marks**
 c) Explain bounded deviation algorithm for straight line motion. **5 marks**
 d) Define 1) Pixel function, 2) Shrink Operator m 3) Swell operator 4) DOF 5) Dexterous work envelope **5 marks**
 e) What are the advantages & disadvantages of PLC system. **5 marks**

- Q2. a) Explain the characteristics of the Inverse Kinematics solutions. and what are the different methods to solve Inverse Kinematics problem **10 marks**
 b) Show that the fundamental rotation and translation matrices associated with the unit vectors commute . i.e., $\text{Trans}(\lambda, i^k) \text{Rot}(\phi, k) = \text{Rot}(\phi, k) \text{Trans}(\lambda, i^k)$. **10 marks**

- Q.3.a) F and M are two fixed and mobile right handed orthonormal coordinate frames . M frame was translated by 2 units along f^2 axis of F and 2 units along axis f^3 of F. Then , the M frame was rotated about axis f^3 of F by $\pi/2$ radians . If $(p)^M = (0, 0, 1)^T$ Find $[p]^F$ **10 marks**

- b) Obtain the Inverse Kinematics solution of the 4 axis Adept - 1 SCARA robot with its IK algorithm starting from the arm matrix. Explain Each joint variable computation in brief. **10 marks**

- Q.4. a) Compare area descriptors over to line descriptors ? **5 marks**
 b) Explain inverse arm kinematics solution for a 2 DOF articulated coordinate robot **5 marks**
 c) Explain how to normalize the performance index for removing the effects of average light intensity. **10 marks**

- Q.5. a) Explain how the chain code of a boundary is constructed? **10 marks**
 b) Explain the template matching algorithm for object recognition. **10 marks**

- Q.6. a) Explain workspace analysis of 5 axis Rhino XR-3 Robot arm **10 marks**
 b) Write a PLC ladder logic programme for 4 junction traffic light controller **10 marks**

- Q.7. Write a short note on **20 marks**
 i) Specifications of robots
 ii) Linear interpolation method .
 iii) Screw transformation
 iv) Gross motion planning

QP Code : 15997

(3 Hours)

[Total Marks : 100

- N.B. (1) Question No. 1 is compulsory.
(2) Answer any **four** questions out of remaining **six** questions.
(3) Assume suitable **data** wherever **required**.

1. (a) Explain SPI protocol for serial communication. 5
(b) Explain Task and Task States. 5
(c) Draw and explain data frame format for CAN bus. 5
(d) Differentiate between RS 232 and RS 485. 5
2. (a) Suggest various techniques used for interprocess communication in an Embedded system. 10
(b) What is shared data problem ? Explain different types of semaphores. 10
3. (a) Compare schedulers used in hard real time system. 10
(b) Explain why ARM processor is one of the most commonly used 32 bit embedded processor. Draw architecture of ARM7 TDMI processor. 10
4. (a) Explain address space (Memory Map) of MSP 430. 10
(b) Explain in detail Link List, Pipes, Queue and Mailboxes. 10
5. (a) What is bounded and unbounded priority inversion problem ? Suggest solution used for same. Explain with suitable example. 10
(b) Describe embedded programming tools like compiler, cross compiler, integrated development environment, debugging tools, in circuit emulator. 10
6. (a) What is the role of processor reset and system reset explain the need of watchdog timer and reset after the watched time. 10
(b) Design an embeded system to control room temperature and humidity :— 10
 - (i) Draw FSM/Petrinet
 - (ii) Draw block diagram
 - (iii) Suggest hardware specification (viz. controller, memory, peripherals)
 - (iv) Give list of tasks and device drivers.
7. (a) Black Box Testing 20
(b) Digital Signal Controller
(c) Explain System on Chip (SOC).

QP Code : 15686

(3 Hours)

[Total Marks : 100]

- N.B. :** (1) Questions No. 1 is **compulsory**.
 (2) Answer any Four questions out of remaining six questions.
 (3) Assume any suitable data wherever required

1. (a) Explain H tree clock distribution. 5
 (b) Explain how ESD (electro-static discharge) affect the MOSFET. 5
 (c) If the width and length of the interconnect is reduced by 30%, then the propagation delay of an interconnect will increase or decrease, by how much %? 5
 (d) Draw and explain Carry save adder. 5
2. (a) What would be the conductor width of power and ground wires to a 50 MHz clock buffer that drives 100 pF of on-chip load to satisfy the metal-migration consideration ($J_{AL} = 0.5 \text{ mA}/\mu\text{m}$)? What is the ground bounce with chosen conductor size? The module is $500 \mu\text{m}$ from both the power and ground pads and the supply voltage is 5 volts. The rise/ fall time of clock is 1ns. (Assume sheet resistance of wire = $0.05 \Omega \text{ sq}$). 10
 (b) Draw 1T DRAM cell and explain its write, read, hold and refresh operation. 10
3. (a) Explain 4-bit CLA adder with its carry equations, logical network and write its Verilog description. 10
 (b) Give and explain CMOS input protection circuits. 10
4. (a) Give and explain the maximum and minimum frequency calculation of clock signal which determine the data transfer rate through cascade system. 10
 (b) Draw 4x4 pseudo-n MOS ROM array circuitry having stored following data. 0011, 1010, 1100, 0101. Also list the no. of address pins, data pins and word lines. 10
5. (a) Explain the need of frequency compensation in CMOS operational amplifier. 10
 (b) Give and explain single phase clock system and explain its drawback. 10
6. (a) Explain various technique of clock generation and clock stabilization. 10
 (b) What is cross talk in IC's? Explain various methods to reduce it. 10
7. Write short notes on any three 20
 - (a) Manchester carry chain circuits
 - (b) Reliability issues in CMOS circuits
 - (c) Low power design consideration
 - (d) Switch capacitor amplifier.

QP Code : 15757

[3 Hours]

[Total Marks: 100

- N.B.** (1) Question no. 1 is compulsory.
 (2) Answer any four questions out of remaining six.

1. Answer any four:—

20

- (a) Distinguish between dual access RAM and single access RAM used in on-chip memory of 5X.
- (b) How a higher throughput is obtained using VLIW architecture? Give an example of DSP that has VLIW architecture.
- (c) Explain briefly the main features of programmable DSPs.
- (d) Explain the six staged pipeline execution of TMS320C54XX.
- (e) Differentiate between MAC and MACD instruction by giving suitable example.
2. (a) Explain the organization of signal samples and filter coefficients in circular buffers for FIR filter implementation. Which memory mapped registers control the circular buffer operation? 10
- (b) With the help of neat block diagram explain ALU of a DSP system. 6
- (c) Explain the purpose of a program sequencer. 4
3. (a) Explain on-chip peripherals of TMS320C5X. 10
- (b) Explain with examples any four data addressing modes of TMS320c54xx processor. 10
4. (a) Describe the multiplier/adder unit of TMS320c54xx processor with a neat block diagram. 6
- (b) Explain PMST register. 8
- (c) Explain the functioning of barrel shifter in TMS320C54XX processor. 6
5. (a) Explain the architecture of ADSP 21XX with the help of functional block diagram. 10
- (b) Explain the features of TMS320C6X processor and compare the same with TMS320C54XX processor. 10
6. (a) With the help of neat diagram, explain. CSSU of TMS320C54X 10
- (b)

A	B	DP	SP	1020	1125
45 h	33h	20h	1105h	33	23

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Write an assembly language program which initializes the registers to the values given in above Table using: 10

- (i) Absolute addressing
- (ii) Direct addressing using DP
- (iii) Direct addressing using SP
- (iv) Indirect addressing with AR2. AR3 as memory address pointers.

7. (a) Explain:— 6
- (i) Bit reversal addressing
 - (ii) Parallelism
 - (iii) Guard bits.
- (b) Identify the addressing modes of the operands in each of the following instructions and their operation. 8
- (i) ADD B
 - (ii) ADD #1234H
 - (iii) ADD 5678H
 - (iv) ADD +*ADDRREG
- (c) Write note on real-time applications of PDSPs. 6

QP Code : 15754

(3 Hours)

[Total Marks : 100

N.B : (1) Question no.1 is compulsory.
(2) Attempt any four from the rest.

1. (a) Explain in brief the various security threats. 5
(b) State the principle of WDM and advantages of DWDM. 5
(c) Describe an ATM cell in detail. 5
(d) Compare TCP/IP and OSI model. 5
2. (a) What is the role played by repeaters, hubs, routers, switches and gateways. 10
(b) Describe ubiquitous and hierarchical access and compare them. 10
3. (a) How does frame relay provide congestion control and quality of service? Explain with its frame structure. 10
(b) What is the role of VPI and VCI in ATM. Explain ATM adaptation layer. 10
4. (a) List all the hardware used in SONET and describe their role with the help of a block diagram. 10
(b) State the benefits of RMON and explain. 10
5. (a) Describe the security safeguards used in networking, also explain Firewalls. 10
(b) Discuss on OAMP with respect to network management. 10
6. (a) Explain Inknetting and supernetting with an example. 10
(b) Explain the IPv4 header format and compare it with IPv6. 10
7. Write short notes on the following :—
(a) MAC sublayers of 802.11 20
(b) Packet filtering
(c) NAT
(d) DMZ.

QP Code : 15760

(3 Hours)

[Total Marks : 100

- N.B. : (1) Question 1 is compulsory.
 (2) Solve any **four** questions from remaining **six** questions.
 (3) Assume suitable data whenever **required**.
 (4) **Figure** to the **right** indicates **full** marks.

1. Answer the following :- 20
- (a) What do you mean by learning and list different learning rule.
 (b) Explain Hebbian learning rule.
 (c) Explain Fuzzification and defuzzification process.
 (d) What are the salient features of Kohonen's self organizing learning algorithm.
2. (a) What are the learning strategies in RBF. 10
 (b) Explain perceptron learning rule convergence theorem. 10
3. (a) Explain different fuzzy membership function. 10
 (b) What are the learning factors of back propagation algorithm. 10
4. (a) What is the Hopfield model of neural network ? Explain its algorithm and differentiate discrete and continuous Hopfield model in terms of energy landscape and stable state. 10
 (b) (i) Compare RBF and MLP 10
 (ii) How do you achieve fast learning in ART 2 network.
5. (a) Perform two training steps of the network using delta learning rule for $\lambda = 1$ and $c = 0.25$. Train the network using following data pairs. 10

$$\left(x_1 = \begin{bmatrix} 2 \\ 0 \\ -1 \end{bmatrix}, d_1 = -1 \right), \left(x_2 = \begin{bmatrix} 1 \\ -2 \\ -1 \end{bmatrix}, d_2 = 1 \right) \text{ The initial weight are } w^1 = [1 \ 0 \ 1]^t$$

$$\text{Use } f'(net) = \frac{1}{2}(1 - 0^2)$$

- (b) Find max-min composition and max-product composition. 10

$$R = \begin{bmatrix} 0.8 & 0.1 & 0.1 & 0.7 \\ 0 & 0.8 & 0 & 0 \\ 0.9 & 1 & 0.7 & 0.8 \end{bmatrix} \quad S = \begin{bmatrix} 0.4 & 0.9 & 0.3 \\ 0 & 0.4 & 0 \\ 0.9 & 0.5 & 0.8 \\ 0.6 & 0.7 & 0.5 \end{bmatrix}$$

6. (a) Explain Back propogatin algorithm. 10
 (b) If a fuzzy set defined by : 10

$$A = \frac{0.5}{x_1} + \frac{0.4}{x_2} + \frac{0.7}{x_3} + \frac{1}{x_4} \text{ List all } \alpha \text{ cuts of set A.}$$

7. Write short note on (any four) :- 20
- (a) Boltzman machine
 - (b) LMS algorith
 - (c) Brain state in box model
 - (d) Crossover and mutation
 - (e) Bias and threshold in context of artificial neural network
 - (f) Method steepest descent
 - (g) Fuzzy controller.
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QP Code : **15763**

(3 Hours)

[Total Marks : 100

- N.B. :** (1) Question no 1 is **compulsory**.
 (2) Attempt any **four** questions from remaining **six** questions.
 (3) Assume suitable data if required with justification.

1. (a) Define availability, inherent availability, achieved availability and operational availability. **5**
 (b) Explain the main factors to be considered in PCB design of high frequency amplifier. **5**
 (c) What is importance of bump test? with proper procedure explain how it is conducted? **5**
 (d) Explain importance of memo in documentation. **5**
2. (a) Discuss in detail the important issues in order to ensure signal integrity. **10**
 (b) A 4-channel temperature data logger has the following components (a) Two RTD & Two thermocouple (b) signal conditioning ckt (c) ADC (d) micro controller (e) 4- digit multiplexed LED display and (f) Data memory Explain how will you design software for this. **10**
3. (a) Estimate the reliability of a power supply system at $t = 2 \times 10^6$ Hours **5**

Component	Quantity	failure per 10^6
Transformer	1	0.6
Rectifier Diodes	4	0.2
Capacitors	3	0.3
Regulator	1	0.18

- (b) Explain wave soldering method. **5**
 (c) Differentiate between logic analyzer & spectrum analyzer. **5**
 (d) What is reflection? How will you minimize it. **5**
4. (a) Explain various types of multilayer connections with relevant illustrations. **10**
 (b) Explain the use of transorb, MOV & line filter. **10**
5. (a) Which visual techniques are used in preparing an effecting document? **5**
 (b) Write a note on UL certification. **5**
 (c) Explain bare board testing and in circuit testing. **10**

6. (a) Estimate the parasitic values of the following geometries of pcb tracks (i) Resistance of 20 cm long copper track with 0.6 mm width on a standard 35-micron copper clad laminate $\rho = 1.72 \times 10^{-6}$ ohm-cm. **5**
- (b) While designing a product which guidelines must be considered w.r.t ergonomics and aesthetics. **10**
- (c) Write a note on CPU simulator. **5**
7. (a) Which environmental tests are to be carried out on the following products? why it is necessary? **10**
- (i) Industrial controller used in coalmines
- (ii) A bedside ECG monitor.
- (b) Explain use of DC analysis in product design **5**
- (c) State the importance of enclosure. **5**
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