Aliah University

Odd Semester Examination (Autumn Semester 2022)
3rd year 5th Semester B.Tech. (ECE)

Paper Code: CSEUGOE03   **Full marks: 80**
Paper Name: Object Oriented Programming   **Time: 3 hours**

Group A
Answer all the questions   **1X10=10**

1. _____keyword is used to inherit a class.
   a) extend   b) extends   c) implement   d)implements

2. Which statement is used to terminate loop early?
   a) terminate   b)continue   c) skip   d)break

3. Which statement is used to skip the loop and continue with the next iteration?
   a) continue   b) terminate   c)skip   d)break

4. Which of the following is not an assignment operator?
   a) +=   b)==   c)%=   d)=

5. JAVA interpreter translates ----------------------into machine code
   a) Bit code   b) Byte code   c)Machine code   d)User code

6. JAVA does not support
   a)Operator Overloading b)Global Variable c)Multiple Inheritance   d) All of the above

7. All syntax errors are known as _____ errors.
   a) Run-time   b)Exception   c)Logical   d)Compile-time

8. We cannot create a subclass of _____class.
   a) Abstract   b) Public   c)Static   d)Final

9. JVM stands for
   a) Java Virtual Method b) Java Virtual Machine c)Java Variable and Methods   d) Java Versatile Machine

10. _____ constructor is created when object of particular class is created.
    a) Default   b)Parameterized   c)Copy   d)None of these

Group B

Answer any 5 questions. 5X6=30

1. Differentiate between class and interface.

2. What is an exception? How do we define a try and a catch block?

3. Print the average of three numbers entered by user by creating a class named Average having methods to calculate and print the average.

4. List the type of operators used in JAVA.

5. What is the difference between multitasking and multithreading?

6. Explain super and final keywords with examples.

Group C

Answer any 4 questions 4X10=40

1. Differentiate between Method overloading and method overriding with example. Explain the followings terms: Dynamic Method Dispatch and Encapsulation (6+4)

2. What is a class? How does it accomplish data hiding? Describe the complete life cycle of a thread. (2+3+5)

3. What is an applet? Describe the different stages in the life cycle of an applet. Distinguish between init () and start () methods. (2+4+4)

4. Create a class Complex having two members real and imaginary. Write methods for adding and subtracting two complex numbers. Write a main class to test the Complex class. (10)

5. Define Inheritance. Describe the different forms of Inheritance. What is polymorphism? (3+5+2)

B.Tech. Examination 2022
Electronics and Communication Engineering
(Odd Semester Regular and Supplementary Examination)
Microprocessor and Microcontroller (ECEUGPC10) (ECE)

FM: 80   **Time : 3.00 Hrs**

1   **GROUP A**   (1X10)
(Multiple-Choice Questions)
Answer any ten

(i)   Machine cycles for IN instruction are

  a) 6   b) 5

  c) 4   d) 3

(ii)   RST 7.5 interrupt is

  a) Vectored and maskable   b) Non-vectored and maskable

  c) Non-vectored and non-maskable   d) Vectored and non-maskable

(iii)   The pins that are used by 8085 for serial communication are

  a) HOLD, HLDA   b) INTR , INTA

  c) RESET IN, RESET OUT   d) SID, SOD

(iv)   When a subroutine is called the address of the instruction next to CALL is saved in

  a) Stack pointer   b) Program counter

  c) Stack   d) Combination of flag and Accumulator

(v)   How many address lines are there in 8086 microprocessors?
  a) 16   b) 8

  c) 20   .   d) 12

(vi)   INR instruction affects

  a) All flags.   b) All flags except zero flag.

  c) All flags except carry flag.   d) No flags.

(vii)   Instruction queue of 8086 consists of
  a) 4 data   b) 6 data

  c) 8 data   d) 16 data

(viii)   A single instruction to clear the lower four bits of the accumulator in 8085 microprocessor is

  a) XRI 0F H   b) ANI 0F H

  c) ANI F0 H   d) XRI F0 H

(ix)   If the crystal with 8085 is 2 MHz, the time required to execute an instruction of 20T State is

  a) 20µs   b) 10µs

  c) 40µs   d) 5µs

(x) The data bus of 8085 microprocessor is

    a) Unidirectional   b) Bidirectional

    c) Unidirectional as well as Bidirectional   d) None of these

(xi) Address lines required for 32K-byte memory chip is

    a) 13   b) 14

    c) 15   d) 16

(xii) The number of register pairs of 8085 microprocessor are

    a) 3   b) 4

    c) 2   d) 5

GROUP B
(Long answer type questions)
*Answer any **seven***

2 **(a)** Why the lower byte address bus (A_0-A_7) and data bus (D_0-D_7) are multiplexed? What is the function of ALE pin of 8085 microprocessor and explain with the help of proper diagram.   (5+5)

    (b) Write a program to generate a 100msec time delay considering the operating frequency of 8085 is 4MHz.

3 **(a)** Can the same port address be assigned to two I/O devices if interfaced in peripheral mapped I/O? If yes, how and if no, why? Can 8085 differentiate between memory and I/O device if the I/O is interfaced in memory mapped I/O? Explain.   (5+5)

    (b) Write a program to separate the odd and even numbers in a series of N data bytes. The series starts from 8200H and the value of N is available at 8300H. Store the odd numbers from 8400H and the even numbers from 8500H.

4 **(a)** Write a program to exchange the contents of DE register pair with that of HL register pair, using PUSH, POP instructions.   (5+5)

    (b) Draw the timing diagram for the instruction ADD M stored in memory location 8550H.

5 **(a)** How is pipeline achieved in 8086 microprocessor?   (3+7)

    (b) Draw and discuss in brief the BIU and EU of 8086 microprocessor.

6 Interface the 4KB RAM, 2 KB EPROM and 4 KB EPROM memory devices in 8085 microprocessor in absolute decoding method.   (10)

7 **(a)** Draw and discuss in brief the internal architecture of Intel 8051.   (5+5)

    (b) Discuss the different addressing modes of 8051 microcontroller.

8 Write a 8085 assembly language program to compare two strings. Assume that the first byte of both strings contain the number of bytes in that string. The starting address of the two strings is 9000Hand 9100Hrespectively. If both strings are found equal place 11H in memory location 9500H else place 22H.   (10)

9 **(a)** Draw and explain the control word format of 8255. Write a control word for port A and port C as an input port and port B as an output port.   (7+3)

    (b) Write a program to set PC_4 and reset PC_7 lines using BSR mode in 8255.

10 **(a)** Explain the following signals of 8085microprocessor: (5+5)
    a) READY b) S0 & S1 c) HOLD d) RESET IN

    (b) Draw and explain the flag register of 8085 microprocessor

11 **(a)** How does an 8085 microprocessor responded to INTR interrupt signal?   (7+3)

    (b) Write an instruction to enable the RST 7.5, RST 6.5and disable RST 5.5

B.Tech Examination-2022
Electronics and Communication Engineering
(Odd Semester Regular and Supplementary)
Communication System (ECEUGPC11)

Full Marks: 80   Time: 3.00 Hrs

- *Answer Q.1 and seven questions from rest of the questions.*
- *Answer all parts of a question in same place.*
- *Figures on the right-hand side margin indicate full marks.*
- *Symbols have their usual meaning*

1. **Choose the correct alternative from the given options.**   10x1=10
   (a) The function of the input transducer in a communication system is
      i) to transmit the message signal ii) to modulate the message signal iii) to convert
      message sound signal into electrical signal iv) none of the above
   (b) The percentage of power savings in DSBSC system modulated signal at 80% is
      i) Nil ii) 80% iii) 75.76% iv) 50%
   (c) A 1000 KHz carrier is simultaneously amplitude modulated with 300 Hz and 2 kHz
      audio sine wave. The frequency which will not present in the output is
      i) 998 kHz ii) 999.7 kHz iii) 1000.3 kHz iv) 700 kHz
   (d) In commercial FM broadcasting the maximum frequency deviation is normally
      i) 5 KHz ii) 15 kHz iii) 75 KHz iv) 200 KHz
   (e) The process of transmitting two or more information signals simultaneously over
      the same channel is called
      i) multiplexing ii) telemetry iii) detection iv) modulation
   (f) If a signal band-limited to f_m Hz is sampled at a rate less than $2f_m$, the reconstructed
      signal will be
      i) higher in magnitude ii) smaller in magnitude iii) have higher frequency suppressed
      iv)distorted.
   (g) The non-uniform quantization leads to
      i) improve signal to noise ratio for low level input signal ii) reduce the probability
      of error iii) reduce quantization noise iv) increase signal strength.
   (h) Which is not a digital modulation system?
      i) PAM ii) PCM iii) DM iv) ADM
   (i) A source delivers symbols m_1, m_2, m_3 and m_4 with probabilities $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$ and $\frac{1}{8}$ respectively.
      The entropy of the system is
      i) 1.7 bits/sec ii) 1.75 bits/symbol iii) 1.75 symbols iv) 1.75 symbol/bit
   (j) The capacity of a communication channel with 4 kHz bandwidth and 15 dB SNR is
      approximately
      i) 20000 bps ii) 16000 bps iii) 25000 iv) 8000 bps

2. **(a)** Draw the block diagram of a communication system and briefly explain the function of each
      block.   5
   (b) What is baseband transmission?   2
   (c) Explain the need for modulation in a communication system.   3

3. **(a)** What is meant by the term amplitude modulation?   2
   (b) Define modulation index for AM wave.   2
   (c) Derive an expression for single-tone amplitude modulated wave.   4
   (d) Draw the waveform of an over modulated AM wave and write the condition for over
      modulation.   2

4. (a) Prove that the balanced modulator produces an output signal consisting of two side band only with the carrier removed.   5
   (b) How is a SSB-SC signal demodulated?   3
   (c) A given AM broadcast station transmits a total power of 50 kW when a carrier is modulated by a sinusoidal signal with modulation index of 0.707. Calculate - i) the carrier power ii) the transmission efficiency.   2

5. (a) What is Carson's rule?   2
   (b) Explain the generation of narrowband FM signals with suitable block diagram.   4
   (c) A baseband or modulating signal $x(t) = 5\cos(2\pi \times 10^3 t)$ angle modulates a carrier $A\cos(w_c t)$. i) Determine the modulation index and bandwidth for FM system. ii) Find the change in the bandwidth and modulation index for FM if modulating frequency is reduced to 5 kHz. Assume $k_f = 15$ kHz/volt.   4

6. (a) Explain the varactor diode method for generation of FM signal.   5
   (b) What are the drawbacks of direct method for FM generation?   2
   (c) Explain Pre-Emphasis in FM signal generation.   3

7. (a) State sampling theorem.   2
   (b) What is aliasing? How is it prevented?   2
   (c) Explain flat top sampling technique.   4
   (d) Find the Nyquist rate and the Nyquist interval for the signal $x(t)=\cos(4000\pi t)\cos(1000\pi t)$ 2

8. (a) How is an analog signal converted to a digital signal in PCM system?   5
   (b) Derive the expression for transmission bandwidth in a PCM system.   3
   (c) A television signal having a bandwidth of 4.2 MHz is transmitted using binary PCM system. Given that number of quantization level is 512. Determine transmission bandwidth and output signal to quantization noise ratio.   2

9. (a) Explain Delta modulation in detail with suitable block diagram.   5
   (b) What are slope overload distortion and granular noise in delta modulation and how are they removed in ADM?   3
   (c) Given a sine wave of frequency f_m and amplitude A_m applied to a delta modulator having a step size Δ. Show that slope overload distortion will occur if $A_m > \dfrac{\Delta}{2\pi f_m T_s}$. Here T_s is the sampling period   2

10. (a) The binary data 10101101 is transmitted over a baseband channel. Draw the waveform for the transmitted data using following format - i) Polar RZ ii) Split phase Manchester coding iii) AMI   3
    (b) How is a BFSK signal detected?   3
    (c) Draw the block diagram of DPSK modulator and explain its operation.   4

11. (a) What do you mean by entropy?   2
    (b) Show that the channel capacity of an ideal AWGN channel with infinite bandwidth is given by $C_\infty \cong 1.44 \dfrac{S}{\eta}$ b/s where S is the average signal power is and $\eta/2$ is the power spectral density (psd) of white gaussian noise.   4
    (c) A DMS X has five symbols x_1, x_2, x_3, x_4 and x_5 with $P(x_1)=0.4$, $P(x_2)=0.19$, $P(x_3)=0.16$, $P(x_4)=0.15$ and $P(x_5)=0.1$. Construct a Shannon-Fano code for X and calculate the efficiency of the code.   4

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Bachelor of Technology Examination 2022

Department of Electronics and Communication Engineering

Regular and Supplementary Examination

Micro and Nano Fabrication Process (ECEUGPC12)

FM: 80   **Time : 3.00 Hrs**

(*Answer 20 marks from Section A, 20 marks from Section B, 40 marks from Section C*)
Symbols have their usual meaning. <u>*Answer question 1 in one place.*</u>

Section A

1. **Answer Any Ten Questions <u>in one place</u> (10x2=20)**

   i. What is SOI Technology?
   ii. What is small Geometry Effect?
   iii. What is Heterojunction?
   iv. What is BiCMOS Technology?
   v. What are Common planes of Wafer substrate?
   vi. Write the application of Glass substrate and Plastic substrate.
   vii. What is Lithography?

   viii. What is poly-Si?
   ix. What is monolithic IC?
   x. What is wafer?
   xi. What is thin-film deposition?
   xii. What is native oxide?
   xiii. What is Twin-Tub Process?
   xiv. What is Crystal?
   xv. What is Twin boundary?
   xvi. What is Device Scaling?

Section B

Write short notes on any four topics (4x5=20)

2. Strained-Si device
3. Hot Carrier Effect minimization.
4. General fabrication process steps.
5. CMOS layout and stick diagram.

6. PN diode fabrication
7. Crystal plane and Miller Indices.
8. Oxidation process
9. Inverter threshold voltage engineering

Section C

Answer Any Four Questions (4x10=40)

10. Classify materials based on conductivity. Classify semiconductors and give two examples of each class.   4+6
11. Describe how the substrate for SOI technology is prepared. Write the advantages of SOI technology.   5+5
12. How does the scaling improve device performance? Prove with mathematical deductions.   10
13. Analyze the DC characteristics of CMOS Inverter. Explain the Noise Margin.   8+2
14. Describe Czochralski (CZ) method to produce single crystal Si ingot from poly-Si.   10
15. Describe SiO_2 pattering with suitable diagrams.   10
16. Analyze parasitic capacitive loading model and formulate associated delay model of CMOS Inverter with suitable diagrams.   10
17. Describe fabrication process steps of a monolithic IC containing a BJT and a resistive load.   10

**TOTAL MARKS:**   **80**   **TIME: 3 Hours**

INSTRUCTIONS: -
1. Mention the question number clearly. Answer all parts of a question at single location.
2. Draw circuit & waveforms wherever necessary.
3. Acronyms & symbols have their usual meaning unless otherwise specified.
4. Make suitable assumptions wherever necessary.

Answer Que-1 and any seven from the rest.

Que-1 (a)   Define servomechanism.   **[2]**

(b)   Define phase crossover frequency and phase margin.   **[2]**

(c)   Draw op-amp realization circuit of phase lead network.   **[2]**

(d)   The gain margin of a certain system is 20dB. Determine the point of intersection of Nyquist plot with negative real axis of $GH(s)$ plane.   **[2]**

(e)   Define state variables.   **[2]**

Que-2 (a)   State Mason's gain formula for the determination of overall transfer function from signal flow graph of the system.   **[2]**

(b)   Determine the overall transfer function of the system $\frac{C(s)}{R(s)}$ shown in figure below.   **[8]**
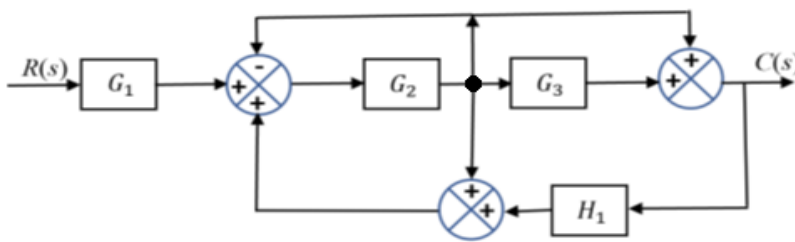
Que-3 (a)   A system is described by the differential equation $\frac{d^2c(t)}{dt^2} + 4\frac{dc(t)}{dt} + 8c(t) = 8r(t)$ where $c(t) =$ output and $r(t) =$ input. Determine transient response specifications of the given system: rise-time, settling-time and maximum peak overshoot for a unit step input.   **[8]**

(b)   Consider a unity feedback system with open-loop transfer function $G(s) = \frac{6}{s(s+3)}$. Determine steady-state value of the output of the system for a unit step input.   **[2]**

Que-4 (a)   State BIBO stability criterion.   **[2]**

(b)   A system has the characteristic equation $s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0$. By applying Routh-Hurwitz stability criterion, determine whether the system is stable or not.   **[8]**

Que-5   A unity feedback control system has an open-loop transfer function $G(s) = \frac{K(s+5)(s+9)}{(s+1)(s-1)}$. Sketch the root locus of the closed-loop (unity feedback) system as K is varied from 0 to ∞. Also determine the value of K at break-in point (Use graph paper).   **[10]**

Que-6 Sketch the asymptotic Bode plot for the open-loop transfer function $G(s)H(s) = \frac{2(s+0.25)}{s(s+0.1)(s+0.5)}$ and determine the stability of the closed-loop system (Use semilog graph paper). **[10]**

Que-7 Sketch Nyquist plot and determine stability of the closed-loop system whose open loop transfer function is $G(s)H(s) = \frac{5}{s(s+1)(s+2)}$. Also, determine the gain margin of the system. **[10]**

Que-8 (a) Draw op-amp realization circuit of Proportional-Integral-Derivative (PID) controller and derive its transfer function. **[5]**

(b) Consider a system with $G(s) = \frac{1000}{(s+10)}$ and $H(s) = 1$. Design a feed-forward PI controller so that the damping ratio and natural frequency of oscillation become 0.707 and 10 rad/s respectively. **[5]**

Que-9 (a) Develop the block diagram of an armature controlled D.C motor. Also find out the transfer function $G(s) = \frac{\omega(s)}{E_a(s)}$; where, $\omega(s)$ is the angular velocity of the rotor shaft & $E_a(s)$ is the voltage applied to the armature winding of the motor in Laplace domain. **[5]**

(b) Consider a unity feedback system with open-loop transfer function $(s) = \frac{K(s+5)}{s(s+6)(s+7)(s+8)}$. Determine the value of gain K, such that the system has a 10% steady-state error for unit ramp input. **[5]**

Sub: Power Electronics Devices & Converters   Code- EENUGPC17

Full Marks: 80   Duration: 3 hrs

Instructions: 1. **Use separate answer scripts for two groups.**
2. Mention the question number clearly and write all the parts of a question at one place.
3. Write answers to the point, keeping in mind the allotted marks.
4. Draw circuit/figure & waveforms wherever applicable (including numerical).
5. Make suitable assumptions wherever necessary, symbols and notations have their usual meanings.

Group - A
Answer any five (5 X 10 = 50 marks)

Que-1 (A) Describe the reverse recovery characteristics of power diodes. Show that reverse recovery time and peak inverse current are dependent upon storage charge and rate of change of current. **5**

(B) A bipolar transistor, with current gain $\beta=55$, has load resistance $R_c=15\Omega$, dc supply voltage $V_{cc}=200V$ and input voltage to base circuit, $V_B=12V$. For $V_{CES}=1.4V$ and $V_{BES}=1.7$ V, Calculate **5**

   (i)   The value of R_B for operation in the saturated state.

   (ii)   The value of R_B for an overdrive factor 7.

   (iii)   Forced current gain.

Que-2 (A) Describe the working principle of n-channel depletion type power MOSFET with its internal structure and transfer characteristics. **5**

(B) A single-phase half-wave diode rectifier feeds power to (i) RL load and (ii) RL load with freewheeling diode across it. Describe the working of this rectifier for both these parts with relevant waveforms and bring out with the differences if any. Hence point out the effect of using a freewheeling diode. **5**

Que-3 For a 1-phase full converter, sketch input and output voltage waveform and voltage variation across any one thyristor for one complete cycle for a firing angle delay of 60° and 120°. Also show the current waveform for R-load. **10**

Que-4 (A) What is current limit control? How does it differ from time ratio control? Which of these control strategies is preferred over the other and why? **5**

(B) What is meant by step-up chopper? Explain its operation. Sketch the input voltage, output voltage, input current and output current waveforms. State the various assumptions made. **5**

Que-5 (A) A single-phase ac voltage controller with two SCRs connected in antiparallel must have **4**
isolated triggering sources. Why? Explain with suitable diagram.

(B) For a single -phase voltage controller feeding a resistive load, draw the waveforms of **6**
source voltage, gating signals, output voltage, source and output currents and voltage
across any one SCR. Describe its working with reference to the waveforms drawn.

Que-6 Using mid-point type cycloconverter find out the triggering sequence for the obtaining **10**
single-phase $\frac{f}{3}$ Hz output frequency from a single-phase source having supply frequency f
Hz. Illustrate your answer with appropriate circuit and waveforms. The conduction of
various thyristors must be shown in the waveform.

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Group - B
Answer any three (3 X 10 = 30 marks)

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Que-7 Describe the half-bridge voltage source inverter with circuit, waveform etc. What is the **10**
purpose of connecting anti-parallel diodes with the main switching devices? When these anti-
parallel diodes come into play? What precaution is necessary when triggering the switches
of the same leg of the inverter?

Que-8 (A) A single-phase full bridge inverter using transistors, is feeding a purely resistive load of **7**
12 Ω. The input dc voltage is 300 V. Calculate (a) RMS value of output voltage (b) RMS
value of fundamental component of output voltage (c) output power (d) fundamental
frequency output power (e) average & peak current of each transistor (f) harmonic factor
for fifth harmonic and (g) %THD of the output voltage.

(B) Define the terms Harmonic Factor, Lowest Order Harmonic & Total Harmonic Distortion **3**
in relation with performance of inverters.

Que-9 (A) Explain the construction, operation and v-i characteristic of Thyristor explaining all the **7**
regions of the v-i characteristic.

(B) Draw and explain the symbol and characteristics of DIAC and TRIAC. What type of **3**
applications they can be used in?

Que-10 Draw and explain the operation table (table indicating the conducting switches, phase **10**
voltages & line voltages in each of the six modes) for a three-phase inverter in 180-degree
mode. Using graph paper, draw the gate currents and phase and line voltages for the said
inverter.

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