

2023-24
B. TECH. (BACKLOG) EXAMINATION
COMPUTER ENGINEERING
DIGITAL ELECTRONICS
COC-3080

Maximum Marks: 60

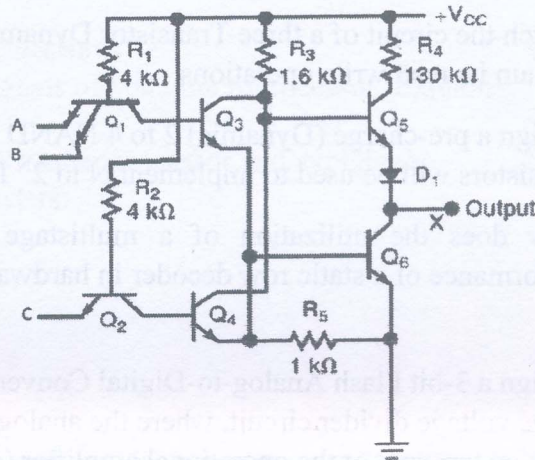
Credits: 04

Duration: Two Hours

Notes:

- i. Attempt all questions. Assume suitable data if missing.
- ii. Symbols used have their usual meanings.
- iii. Marks allotted and Course Outcomes (COs) are indicated against each question.

Q.No.	Question	CO	M.M.
1(a)	Analyze the TTL circuit shown in the figure and determine the output logic function.	(CO1)L4	[08]



- | | | | |
|------|--|---------|------|
| 1(b) | Implement the Carry-Out circuit of a full adder in CMOS technology and ascertain the transistor dimensions required for the circuit. Ensure that the rise time and fall time at the input of the inverter used in the circuit are identical to those of the minimum size of a CMOS inverter. Assume that the transistor geometry of a minimum size inverter is specified as $(W/L)_p = 5/2$ and $(W/L)_n = 3/2$. | (CO1)L5 | [07] |
|------|--|---------|------|

OR

- | | | | |
|-------|--|---------|------|
| 1(b') | Prove that, the collector current of the transistor in Emitter Coupled Logic (ECL) gates switches from one transistor to another transistor. Why an Emitter Follower is generally connected to the output of an ECL gates? | (CO1)L5 | [07] |
| 2(a) | Design a NOR Flash ROM circuit that store the function $X=Y^2 - 4Y + 3$. (X is a 2-bit number) Indicate the programmed transistors of the array. | (CO2)L6 | [07] |

OR

contd...2.

- 2(a') Design the Look Up Table of the FPGA for the functions of a Full Adder. What is Programmable Switch Matrix ? (CO2)L6 [07]
- 2(b) In a microcontroller-based system, the memory requirement is of 16K bytes but the E²PROM ROM chips available are of capacity 4K X 4. How these E²PROM Chips can be used to obtain the required capacity? Explain with the suitable diagram. (CO2)L6 [06]
- 3(a) Explain the operation of a 3 Electrode per bit CCD shift register with proper timing Diagram. (CO3)L4 [06]

OR

- 3(a') Sketch the circuit of a three Transistor Dynamic RAM (3T DRAM) and explain its read write operations. (CO3)L4 [06]
- 3(b) Design a pre-charge (Dynamic) 2 to 4 NAND Decoder. How many transistors will be used to implement N to 2^N Decoder? (CO3)L6 [06]
- 3(c) How does the utilization of a multistage static decoder enhance the performance of a static row decoder in hardware aspects? (CO3)L5 [03]

- 4(a) Design a 3-bit Flash Analog-to-Digital Converter (ADC) with equal resistors in the voltage divider circuit, where the analog input voltage is applied to the positive terminal of the operational amplifier (op-amp). Determine the digital output of this converter when subjected to an analog input voltage of 1.6 volts, given that the reference voltage (V_{ref}) is 4 volts. CO3)L6 [08]

OR

- 4(a') Design an inverting R/2R Ladder Digital to Analog (DAC) with feedback resistor equal to R and derive its output expression. Determine the step size of this DAC. (CO3)L6 [08]
- 4(b) In a Dual-Slope Analog-to-Digital Converter (ADC), a 10-bit counter is employed with a reference voltage (V_{ref}) set at -20 volts. Determine the digital representation for an analog input of 4.8 volts in this configuration. (CO4)L5 [07]

2023-2024
B. TECH. (AUTUMN SEMESTER) EXAMINATION
(COMPUTER ENGINEERING)
MICROPROCESSOR THEORY AND APPLICATIONS
(COC-3090/AIC3090)

Duration: Two Hours

MM: 60

NOTE: (i) Attempt all questions. All questions carry equal marks
(ii) You may choose alternative, if indicated by 'OR'
(iii) Marks allotted to each question and course outcome (CO) covered are indicated against each question.

Q. No	Questions	CO's	Marks
1	(a) Name the control and status signals of 8085 microprocessor. Explain the use of each signal pin.	CO1	7
	(b) Draw the block diagram of 8085 microprocessor and explain the functions of the following registers: (i) W & Z registers (ii) Temporary register (iii) Instruction register	CO1	8
OR			
	(b') Draw the timing diagram for the instruction PUSH B. Assume that the opcode C5 is stored at a memory location 2056H, B = 32, C = 57 and SP = 2099H.	CO1	8
2	(a) After the execution of instruction RIM, the accumulator contained 49H. Explain the accumulator contents.	CO4	7
	(b) Compare the similarities and differences of CALL and RET instructions with PUSH and POP instructions.	CO3	8
OR			
	(b') Write an assembly language program based on 8085 microprocessor instruction set to search the smallest data in a set of twenty 8-bit numbers stored in memory.	CO3	8
3	(a) For the following data declaration, show the memory picture in x86 processor. Assume that beginning of array <i>list</i> , i.e <i>list</i> [0] is stored at 0x6000f0	CO2	5

list dd 101, 103, 105, 107

Contd.....2.

- (b) Assume the following data declaration: CO3 5

section .data

```
list dd 1002, 1004, 1006, 1008, 10010
len dd 5
sum dd 0
```

Write assembly language program segment for x86 processor to find sum of the numbers declared in *list* using loop instruction.

- (c) What is the general format of memory addressing in x86-64 processor? Write the x86-64 instruction to explain the following addressing modes: CO2 5

Register, Immediate, Memory

- 4 (a) What do you understand by command word of 8259 programmable interrupt controller? Explain initialization for different ICWs and OCWs. CO4 7
- (b) Explain the operation of 8255 PPI Port A programmed as input and output in Mode 1 with necessary handshaking signals. CO5 8'

OR

- (b') Draw the control word of 8253 timer/counter and list the operating modes of 8253 timer/counter. CO5 8

2023-24

**B.TECH. IV SEMESTER EXAMINATION
COMPUTER ENGINEERING
OPERATING SYSTEMS
COC-3100/AIC3100**

Maximum Marks: 60**Credits: 04****Duration: Two Hours***Answer all the questions.**Make reasonable assumptions for missing data.**Notations and abbreviations have their conventional meaning.*

Q.No.	Question	CO	M.M.
1(a)	State true or false: (i) Multiprogramming means running many processes in parallel. (ii) Graphical user interface (GUI) is always provided by an OS. (iii) A reason for a parent process to terminate its child is that the parent has spawned another child process. (iv) A process goes from running to waiting state when there is an interrupt. (v) Throughput is the average number of processes in the ready queue. (vi) Waiting time + execution time + I/O time is called response time. (vii) Waiting time is the time a process waits as a parent for the child to complete. (viii) Virtual memory is another term for the hard disk.	CO1	[8]
1(b)	With the help of a diagram explain the UNIX system structure, and discuss the importance of layered approach in system design. OR	CO5	[7]
1(b')	Differentiate between system calls and API. Explain the various categories of system calls taking examples from Windows and Linux.	CO5	[7]
2(a)	For processes (P1, P2, P3, P4, P5) arrival times are (0, 1, 2, 3, 4), burst sizes are (10, 1, 2, 1, 5) both in <i>ms</i> , and priorities are (3, 1, 4, 5, 2), with the convention that smaller the number, higher is the priority. Draw Gantt charts and calculate average waiting time for each of (i) preemptive priority, (ii) preemptive SJF, and (iii) FCFS scheduling algorithms.	CO2	[8]
2(b)	With the help of suitable diagrams explain multithreading and its various models. Explain the concepts of SMP and processor affinity. OR	CO2	[7]

contd...2

2(b') What is a process? Draw a diagram to explain the structure of a process in memory, thereby explaining heap and stack. Draw a state diagram showing the process states and their transitions. CO2 [7]

3(a) Using the 2-process Peterson's algorithm, design a solution for critical section problem, first for 3 processes, then for n process. Also, argue that your solution is correct. CO3 [8]

3(b) What are semaphores? Describe the structures of producer and consumer processes using semaphores that ensure mutual exclusion. CO3 [7]

OR

3(b') What is deadlock? Describe the four conditions that when occur simultaneously can give rise to a deadlock. Examine how each of these conditions are avoided in the deadlock avoidance algorithm. CO3 [7]

4(a) In a certain system with virtual memory, page references are made in the following order: CO4 [8]

1, 0, 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7

Assuming three frames, which are initially empty, compute the number of page faults for the following page replacement algorithms:

- (i) Least recently used (LRU)
- (ii) Optimal (OPT)

OR

4(a') Consider a disk with 200 cylinders numbered 0 to 199. The queue of I/O requests is for blocks on the following cylinders: CO4 [8]

99, 184, 35, 124, 16, 128, 66, 68

in that order. If the head is currently positioned at cylinder 50 and is moving towards cylinder 199, what is the total head movement (in number of cylinders) for following disk scheduling algorithms:

- (i) Shortest seek-time first
- (ii) C-SCAN

4(b) Draw the diagram of paging hardware with translation look-aside buffer (TLB). Explain the diagram. CO4 [7]

2023-24

B. TECH. (ODD SEMESTER) EXAMINATION
AI and COMPUTER ENGINEERING
COMMUNICATION ENGINEERING
ELA3400

Maximum Marks: 60

Credits: 04

Duration: Two Hours

*Answer all questions.**Assume suitable data if missing.**Notations and symbols used have their usual meaning.*

Q.No.	Question	CO	M.M.
1(a)	Briefly explain Frequency modulation (FM) with suitable diagram? Design an Armstrong FM modulator to generate an FM signal with carrier frequency = 97.3 MHz and $\Delta f = 10.24$ kHz. A NBFM generator of $f_{c1} = 20$ kHz and $\Delta f = 5$ Hz is available. A local oscillator with adjustable frequency between 400 kHz and 500 kHz is available for frequency mixing. Constraint: Only frequency doubler can be used as multipliers.	(CO1)	[3+5]
OR			
1(a')	Describe the role of carrier frequency in the process of modulation. An angle modulated signal with carrier frequency $w_c = 2\pi \cdot 10^5$ is described using the following equation $\theta(t) = 10\cos(w_c t + 5\sin 3000t + 10\sin 2000\pi t).$ Find the frequency deviation Δf and estimate the bandwidth of $\theta(t)$.	(CO1)	[2+6]
1(b)	An amplitude modulated signal is given by $\varphi_{AM}(t) = 10\cos(2\pi \cdot 10^6 t) + 5\cos(2\pi \cdot 10^6 t)\cos(2\pi \cdot 10^3 t) + 2\cos(2\pi \cdot 10^6 t)\cos(2\pi \cdot 10^3 t)$ volts. Find i. Carrier frequency, ii. upper sideband frequencies, iii. lower side band frequencies, iv. bandwidth.	(CO1)	[7]
2(a)	Five signals each of bandwidth 240 Hz, are to be transmitted simultaneously by time-division multiplexing. The signals must be sampled at least 20% above the Nyquist rate. Framing and synchronization requires an additional 0.5% extra bits. A 9-bit PCM encoder is used to convert these signals before they are time-division multiplexed. Determine	(CO2)	[8]

contd...2.

- (i) Number of bits per frame.
(ii) Slot duration of each channel.
(iii) Bit rate of the system.

OR

- 2(a') In case of Time division multiplexing, suppose the data rates of the channels (CO2) [8]
to be multiplexed are different. Describe three techniques to manage the data
rate in such cases with suitable diagrams. In your description write the data
rates of each channel as well.
- 2(b) The highest frequency component of a signal is 4.2 MHz and it is transmitted (CO2) [7]
using binary PCM system. Given that the number of quantization levels is
512. Determine
- Number of bits per sample
 - Transmission Bandwidth
 - Bit rate
 - Signal to Quantization Noise ratio

- 3(a) Prove that in case of Binary PSK, the average probability of symbol error (P_e) (CO3) [4+4]
is equal to $\frac{1}{2} \operatorname{erfc} \left(\sqrt{\frac{E_b}{N_o}} \right)$, where E_b = transmitted signal energy per bit, and
 N_o = spectral noise density, and $\operatorname{erfc}(\cdot)$ is the complementary error function.
Draw suitable diagrams and mention the mathematical steps properly with
reasoning.

OR

- 3(a') Draw a neat and clean diagram with proper labelling of the power spectra of (CO3) [4+2]
M-ary PSK signals for $M=2, 4$, and 8 . Write the equation for baseband power
spectral density of M-ary PSK in terms of the symbol duration. What is the
relationship between channel bandwidth and bit rate of the M-ary PSK. [2]

contd. on p. 3.

- 3(b) Find the average power for the constellation diagram shown in Fig. 3b. (CO3) [7]
Consider the same minimum distance of all the constellations as D. Write the steps properly.

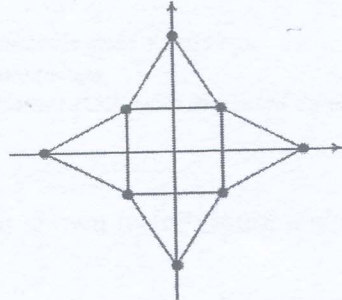


Fig. 3b

- 4(a) Explain the role of probability in data compression? Write three desired (CO4) [5]
properties of source codes?
- 4(b) Briefly describe the concept of Hamming distance along with its role in error (CO4) [10]
detection and correction. Let the data word be 0101. Construct the
corresponding 7-bit Hamming code word. Assume that while transmitting
this code word, there is error at the 2nd bit of the code word. Show how the
Hamming code can correct this error. Now if the 2nd and 3rd bit both are in
error after transmission, can the Hamming code correct these errors. Mention
the reason for it.

2023-2024

B.TECH. (AUTUMN SEMESTER) EXAMINATION
MEH-3450: ENGINEERING ECONOMY & MANAGEMENT

(COMPUTER/ARTIFICIAL INTELLIGENCE/CHEMICAL/PETROCHEMICAL ENGINEERING AND FOOD TECHNOLOGY)

Maximum Marks: 60

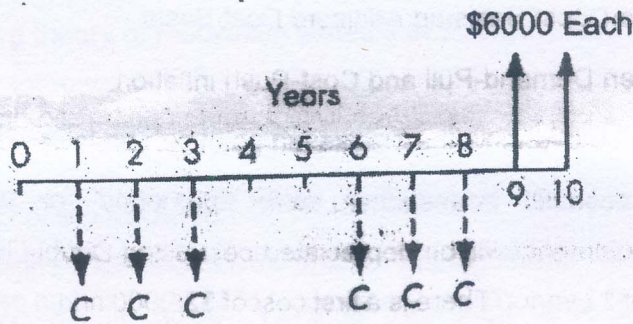
Duration: Two Hours

All questions are compulsory.
Assume data suitably, if required.

- 1(a) Write one practical implication of the Equilibrium Point on the supply-demand curve. [CO1] [01]
- 1(b) On the Cost-Revenue Curve, show the regions of Profit and Loss. [CO1] [01]
- 1(c) Write in brief, how the equilibrium point changes if variable cost is decreased. [CO1] [02]

OR

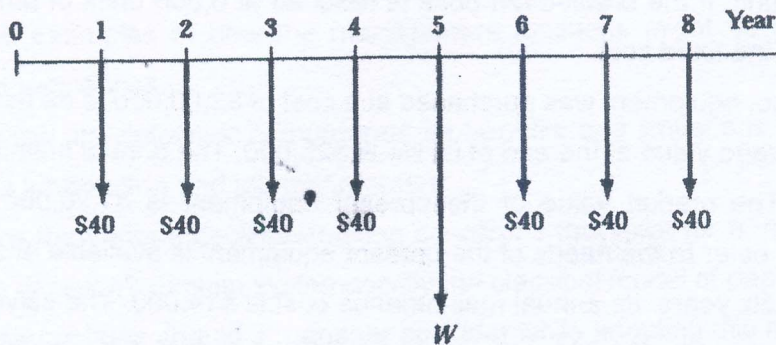
- 1(c') Differentiate between Monopoly and Oligopoly. [CO1] [02]
- 1(d) Differentiate between Nominal and Effective Interest Rates. [CO1] [02]
- 1(e) From the cash flow diagram, find the value of C (in \$) that will establish the economic equivalence between the deposit series and the withdrawal series at an interest rate of 8% compounded annually. [CO1] [04]



OR

- 1(e') For the cash flow diagram shown, determine the value of W that will render the equivalent future worth in 8 years equal to \$500 at an interest rate of 10% per year. [CO1] [04]

$i = 10\%$ per year



Contd....2

1(f) Two alternative machines are being considered for a manufacturing process. Machine 'A' has a first cost of \$75,200 and its salvage value at the end of 6 years of estimated service life is \$21,000. The operating costs of this machine are estimated to be \$6,800 per year. Extra income taxes are estimated at \$2,400 per year. Machine 'B' has a first cost of \$44,000 and its estimated salvage value at the end of 6 years' of service is estimated to be negligible. The annual operating costs will be \$11,500. Compare these two alternatives by the present worth method at $i=13%$ per year. [CO1] [05]

OR

1(f) The purchase of a truck with an operator's platform on a telescoping hydraulic boom will reduce labour costs for sign installations by \$15,000 per year. The price of the boom truck is \$ 93,000 and its operating costs will exceed those of present equipment by \$250 per month. The resale value is expected to be \$18,000 in 8 years. Should the boom truck be purchased when the current available interest rate is 7%? [CO1] [05]

2(a) Define "Profitability Index" in the context of B/C Analysis. [CO2] [01]

2(b) Define Debt-Equity Ratio. [CO2] [01]

2(c) Differentiate between Cost Basis and Adjusted Cost Basis. [CO2] [01]

2(c) Differentiate between Demand-Pull and Cost-Push inflation. [CO2] [02]

2(d) On the Cost-Volume curve, how the breakeven point can be lowered? [CO2] [02]

2(e) Underwater electroacoustic transducers were purchased for use in SONAR applications. The equipment will be depreciated best using Double Declining Balance Method over a life of 12 years. There is a first cost of \$25,000 and an estimated salvage of \$2500. Calculate the depreciation and book value for 1st & 4th years. [CO2] [03]

OR

2(e) For a manufacturing firm, when the volume of production is 3,000 units, the average cost is \$4 per unit and when the volume of production is 4,000 units, the average cost is \$3.50 per unit. If the break-even point is reached at 5,000 units of production and sale, find out the fixed cost. [CO2] [03]

2(f) Two years ago, equipment was purchased at a cost of \$2,00,000 to be useful for eight years. Its salvage value at the end of its life is \$25,000. The annual maintenance cost is \$25,000. The market value of the present equipment is \$1,20,000. Now, new equipment to cater to the needs of the present equipment is available at \$1,50,000 to be useful for six years. Its annual maintenance cost is \$14,000. The salvage value of the new equipment is \$20,000. Using an interest rate of 12%, find whether it is worth replacing the present equipment with the new equipment. [CO2] [05]

OR

Contd... 3.

2(f) In the past, the Afram Foundation has awarded many grants to improve the living and medical conditions of people in war-torn and poverty-stricken countries throughout the world. In a proposal for the foundation's board of directors to construct a new hospital and medical clinic complex in a deprived central African country, the project manager has developed some estimates. These are developed in a manner that does not have a major negative effect on prime agricultural land or living areas for citizens. [CO2] [05]

Award amount: \$20 million (end of) first year, decreasing by \$5 million per year for 3 additional years; local government will fund during the first year only.

Annual costs: \$2 million per year for 10 years, as proposed.

Benefits: Reduction of \$8 million per year in health-related expenses for citizens.

Disbenefits: \$0.6 million per year for the removal of arable land and commercial districts.

Use the conventional and modified B/C methods to determine if this grant proposal is economically justified over a 10-year study period. The foundation's discount rate is 6% per year.

3(a) *Fill in the blanks*

[CO3] [1x3]

- i) The Herzberg theory of motivation states that.....
- ii)is a statement of the organization's fundamental purpose.
- iii) Power granted through the organizational hierarchy is called

3(b) *Answer any TWO of the following:*

[CO3] [2x2]

- i) Draw and define wide and narrow span of management.
- ii) Define organizational goals? What is their importance in the management process?
- iii) Differentiate between line and staff authority with suitable examples.

3(c) *Answer any TWO of the following:*

[CO3] [4x2]

- i) What are the fundamental functions that comprise the management process? Describe examples of how the management functions might be performed in different sequences.
- ii) What is job specialization? Enumerate its benefits and limitations. Differentiate between job rotation and job enlargement.
- iii) What are the various decision-making conditions that exist for a manager while taking a decision? Explain systematically the classical model of decision-making. What assumptions should a manager consider while adopting this model?

Contd...4.

4(a) Fill in the blanks:

[CO4] [1x3]

- i) A list of important managerial positions in the occupation, who occupies it, how long he/she will remain in position and who is/will be a qualified replacement is known as
- ii) The four P's of marketing mix are
- iii) is a business that transcends national boundaries and is not committed to a single host country.

4(b) Answer any **TWO** of the following:

[CO4] [2x2]

- i) Differentiate between Q/R inventory system and periodic inventory system.
- ii) Demand for part number 1012 was 210 in January, 100 in February and 150 in March. The forecast for January was 140 units. With a smoothing constant of 0.30 and using first order exponential smoothing, what is the April forecast?
- iii) What is a "Market"? List the types of markets that are used by sellers and buyers in a modern exchange economy.

4(c) Answer any **TWO** of the following:

[CO4] [4x2]

- i) What procedures do the human resource managers adopt while planning for human resources? How are the forecast and human resource demand and supply matched? Explain.
- ii) Describe the four basic levels of international business activity. Do you think any organization will achieve the fourth level? Why?
- iii) Define Quality. Discuss the two aspects of quality. Name some quality control tools and explain any one of them in detail.

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