IV SEMESTER B.Tech

MID-SEMESTER EXAMINATION 2022

Course Code- COECC12/ CAECC12/ CDCC12 Course Title- **Data Communication**

Time: 1:30 minutes Max Marks: 15

Attempt all questions. Missing data / information (If any) may be suitably assumed & mentioned in the answer.

Q. No.		Questions	Marks	CO
Q1	a	Suppose two signals are expressed as $S_1(t) = 2, \quad 0 < t < 2$ and $S_2(t) = -3, \quad 1 < t < 2$ Apply the Gram-Schmidt procedure and find and express the signals in terms of basis signals.	2	CO1
	b	Compare instantaneous, natural, and flat top sampling techniques.	1	CO1
Q2	a	A signal with maximum frequency of 200 Hz is sampled at 2.5 times the Nyquist rate. Assuming a quantizer with 100 levels, what would be the bitrate of the PCM signal?	2	CO1
	b	Explain a method to generate and demodulate QPSK wave.	1	CO2
Q3	a	An on-off binary system uses the pulse waveforms $s_i(t) = \begin{cases} s_1(t) = A\sin\frac{\pi t}{T}, 0 \le t \le T \\ s_2(t) = 0, 0 \le t \le T \end{cases}$ Let A=0.2mV and T=2us. Additive white noise with a power spectral density $\frac{N_o}{2} = \frac{10^{-15}W}{Hz}$ is added to the signal. Determine the probability of error when $P(s_1) = P(s_2) = 1/2$.	2	CO2
	b	For the periodic signal $x(t) = 4 + 2\cos(3t) + 3\sin(4t)$. Find the exponential Fourier series.	1	CO1
Q4	a	What is aliasing? Suggest a method to overcome it.	1	CO1
	b	If equiprobable symbols are transmitted in presence of additive White Gaussian Noise, the maximum likelihood criteria converge to minimum distance criteria. With proper justification state whether the statement is true or false.	2	CO2
Q5	a	For a (6,3) systematic linear block code, the three parity check bits are formed from following equations $c_4 = d_1 \oplus d_3$ $c_5 = d_1 \oplus d_2 \oplus d_3$ $c_6 = d_1 \oplus d_2$ a. Write down the generator matrix. b. Construct all possible codes.	2	CO2
	b	In a binary PCM system, for a sinusoidal signal the output signal to quantization noise ratio is to be kept to a minimum of 40dB. Determine the number of required levels and find the corresponding output signal-to-noise quantizing -noise ratio.	1	CO2

B.Tech. (CSE/CSAI/CSDS/MAC) 4th Semester and B.Tech. (ICE/EE) 6th Semester
MID-SEMESTER EXAMINATION, FEB-MARCH, 2022

Course Code: COCSC09/CACSC09/CDCSC09/CMCSC09
Course Title: Operating System

Time: 1.5 Hrs. Max. Marks: 15

Note: Attempt ALL FIVE questions. Missing data/information, if any, may be suitably assumed and mentioned in the answer.

<table>
<tr><th>Q. No.</th><th>Question</th><th>Marks</th><th>CO</th></tr>
<tr><td>1a</td><td>Draw the structure of PCB. Explain how it is used during context switching between two concurrently running processes.</td><td>2</td><td>CO2</td></tr>
<tr><td>1b</td><td>Which of the functionalities listed below need to be supported by the operating system for Real–time systems and Hand-held devices?
1.Batch programming
2.Virtual memory</td><td>1</td><td>CO1</td></tr>
<tr><td>2a</td><td>Consider the following scenario of processes with their priority.
<table>
<tr><th>Process</th><th>Arrival Time (ms)</th><th>Execution Time (ms)</th><th>Priority</th></tr>
<tr><td>P1</td><td>0</td><td>12</td><td>5 (highest)</td></tr>
<tr><td>P2</td><td>2</td><td>25</td><td>1</td></tr>
<tr><td>P3</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>P4</td><td>5</td><td>9</td><td>4</td></tr>
<tr><td>P5</td><td>6</td><td>13</td><td>2</td></tr>
</table>
Draw the Gantt chart for the execution of the processes, showing their start time and end time, using priority based scheduling. Calculate turnaround time and waiting time for each process and average turnaround time and average waiting time for the system.</td><td>2</td><td>CO2</td></tr>
<tr><td>2b</td><td>If a process terminates, will its threads also terminate or will they continue to run? Explain your answer.</td><td>1</td><td>CO2</td></tr>
<tr><td>3a</td><td>Describe three general methods for passing parameters to the operating system.</td><td>2</td><td>CO1</td></tr>
<tr><td>3b</td><td>What is the difference between scheduler and dispatcher and how do they work?</td><td>1</td><td>CO2</td></tr>
<tr><td>4a</td><td>Describe the differences between symmetric and asymmetric multiprocessing. What are the advantages and disadvantage of multiprocessor systems?</td><td>2</td><td>CO1</td></tr>
<tr><td>4b</td><td>In what ways is the modular kernel approach similar to the layered approach? In what ways does it differ from the layered approach?</td><td>1</td><td>CO1</td></tr>
<tr><td>5a</td><td>What are two differences between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?</td><td>2</td><td>CO2</td></tr>
<tr><td>5b</td><td>Why do we use an interrupt controller? Explain how it works?</td><td>1</td><td>CO1</td></tr>
</table>

Fourth Semester–B. TECH

MID-SEMESTER EXAMINATION, FEBRUARY-MARCH 2022

Course Code: COMTC13/ CAMTC13/CBMTC13/CDMTC13

Course Title: Probability and Stochastic Processes

Time: 1:30 Hours | Max. Marks: 25

Note: Attempt all questions. Missing data/information (if any), may be suitably assumed & mentioned in the answer.

Q. No.		Question Marks	CO
1a	If the joint density function of random variables X and Y is $$f_X(x) = \begin{cases} \frac{x^3y^3}{16}; 0 \le x \le 2, 0 \le y \le 2 \\ 0 \ ; \text{otherwise} \end{cases}$$ Then find the marginal density function of X and hence find the E[X – 2].	2.5	CO2
1b	Prove that if *X* follows Hyper-geometric distribution with parameters *r*, *n* and *N*, then *X* follows a Binomial distribution when k → ∞, N → ∞ and (k /N) → p $$P[X = x] = \binom{n}{x} p^x(1-p)^{n-x}.$$	2.5	CO2
2a	If Y_1, Y_2 and Y_3 are independent random variable with their means 4, 9, and 3 and the variances 3, 7, and 5, respectively. Then find out the mean and variance of the random variable: $Y - 8 = 2Y_1 - 3Y_2 + 4Y_3$.	2.5	CO1
2b	Fit a normal distribution to the random variable X representing weight using the method of areas to the following frequency distribution and hence find the theoretical/expected frequency (only for first four class interval).	2.5	CO2

	<table><tr><th>weight</th><th>f(x)</th></tr><tr><td>120-130</td><td>1</td></tr><tr><td>130-140</td><td>1</td></tr><tr><td>140-150</td><td>14</td></tr><tr><td>150-160</td><td>22</td></tr><tr><td>160-170</td><td>25</td></tr><tr><td>170-180</td><td>19</td></tr><tr><td>180-190</td><td>13</td></tr><tr><td>190-200</td><td>3</td></tr><tr><td>200-210</td><td>2</td></tr><tr><td>Total</td><td>100</td></tr></table> The mean and variance of X is given as 165.5 and 15.26 respectively.		
3a	A continuous random variable X that can assume any value between x = 2 and x = 5 has a probability density function given by f(x) = k(1 + x). Find P(X < 4).	2.5	CO1
3b	Define Beta distribution of first kind and find its mean.	2.5	CO2
4a	Two defective tubes get mixed up with 2 good ones. The tubes are tested, one by one, until both defectives are found. What is the probability that the last defective tube is obtained on the second test.	2.5	CO1
4b	If the probability density function of X is given by $f_X(x) = \begin{cases} 6x(1-x);\ 0 < x < 1 \\ 0;\ \text{otherwise} \end{cases}$. Find the pdf of $Y = X^2$.	2.5	CO1
5a	The first three moments of a distribution about the value 2 of the random variable X are 1, 16, and −40. Find the mean and variance of X.	2.5	CO1
5b	A continuous random variable X has the probability density function, $f_X(x) = \begin{cases} e^{-x};\ x \geq 0 \\ 0;\ \text{otherwise} \end{cases}$. Show that the Tchebycheff's inequality gives $P[\lvert X-1\rvert > 2] < 1/4$.	2.5	CO2

FOURTH SEMESTER- B. TECH

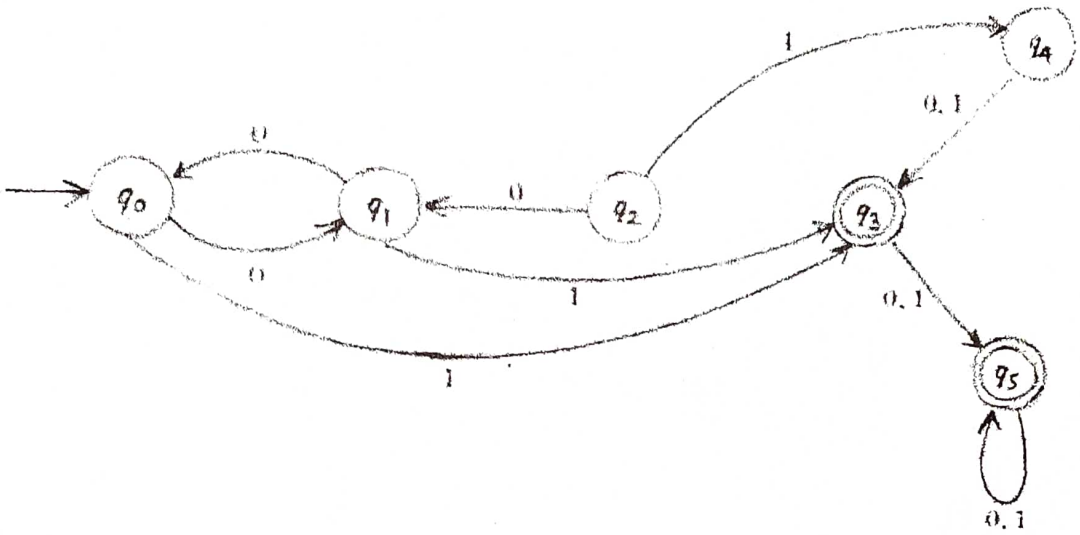
MID-SEMESTER EXAMINATION, March, 2022

Course Code: CACSC10, CDCSC10, COCSC10, CMCSC10

Course Title: Theory of Automata and Formal Languages

Time: 1hr 30 mins. Max.Marks:25

Note: - Attempt all questions. Missing data/information (if any), may be suitably assumed and mentioned in the answer.

Q1	a) What is Kleen closure. Given the language L = {ab, aa, baa}, explain the difference between L* and L^+. b) Find the equivalent minimal DFA for the DFA given below showing all the steps followed. 	2.5+2.5	CO1, CO2
Q2	a) Construct DFA for the language accepting strings containing neither '00' nor '11' as substring over input alphabets ∑ = {0, 1}. Write the regular expression for the same. b) Draw NFA for regular expression (a+b)* b (a+b). Consider the states name in NFA as A, B, C and so on. Convert the above-mentioned NFA into DFA	2.5+2.5	CO1, CO2
Q3	a) Consider the grammar S->0B|1A A->0|0S|1AA B->1|1S|0BB Find leftmost derivation, rightmost derivation and derivation tree for the string 001101. Is this grammar ambiguous? Justify your answer. b) Explain Decision properties of Regular Languages.	2.5+2.5	CO2
Q4	a) Prove L = $\{0^n110^n \mid n \geq 1\}$ is regular/not regular using Pumping Lemma b) Construct a Mealy machine with ∑={a, b} which can output even, odd according to the total number of a's encountered is even/odd. Convert the obtained Mealy machine to Moore machine.	2.5+2.5	CO2
Q5	a) Construct Context free grammar G such that L(G)={w ∈ {a, b}|w has equal number of a's and b's} For the string aaabbb is this grammar ambiguous? b) State whether the Regular Expression (ab+a)*ab = (aa*b)* is equivalent or not. Prove by showing examples of strings.	2.5+2.5	CO2