CBCS SCHEME

USN | | | | | | | | | | |

BCS301

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Mathematics for Computer Science

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain the mean and variance of Poisson distribution.	06	L2	CO2
	b.	Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) atleast one boy (iii) at most 2 girls. Assume equal probabilities for boys and girls.	07	L3	CO2
	c.	The length of telephone conversation in a booth has been an exponential distribution and found on an average to be 5 minutes. Find the probability that a random call made from this booth (i) ends less than 5 minutes (ii) between 5 and 10 minutes.	07	L2	CO2
		OR			
Q.2	a.	The probability distribution of a finite random variable X is given by X: -2, -1, 0, 1, 2, 3 P(X): 0.1, k, 0.2, 2k, 0.3, k (i) Find the value of k (ii) Variance (iii) $P(x \leq 2)$	06	L2	CO1
	b.	The number of accidents in a year to taxi drivers in a city follows a Poisson distribution with mean 3. Out of 1000 taxi drivers find approximately number of drivers with (i) more than 3 accidents in a year (ii) at most 2 accidents in a year.	07	L3	CO2
	c.	The marks of 1000 students in an exam follows normal distribution with mean 70 and standard deviation 5. Find the students whose marks will be (i) less than 65 (ii) between 65 and 75. A(1) = 0.3413.	07	L3	CO2
		Module – 2			
Q.3	a.	Given the following joint distribution of the random variables X and Y. Find the corresponding marginal distribution. Also compute the covariance. X \ Y: 1, 3, 9 2: 1/8, 1/24, 1/12 4: 1/4, 1/4, 0 6: 1/8, 1/24, 1/12	06	L3	CO2
	b.	A salesmen's territory consists of 3 cities A, B and C. He never sells in the same city for 2 consecutive days. If he sells in city A, then the next day he sells in city B. However if he sells in either B or C then the next day he is twice as likely to sell in city A as in the other city. In the long run how often does he sell in each of the cities.	07	L3	CO3
	c.	Show that $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ is a regular stochastic matrix. Also find the associated unique fixed probability vector.	07	L2	CO2

		OR			
Q.4	**a.**	Define probability vector, regular stochastic matrix, fixed prob vector.	**06**	**L1**	**CO3**
	b.	The joint probability distribution of two discrete random variables X and Y is $f(x, y) = k(2x + y)$, where x and y are integers such that $0 \le x \le 2$, $0 \le y \le 3$. i) Find the value of the constant k. ii) Show that the random variables X and Y are dependent iii) Find $P(X \ge 1, Y \le 2)$.	**07**	**L3**	**CO2**
	c.	A fair coin is tossed thrice. The random variables X and Y are defined as X = 0 or 1 according as head or tail occurs on the first toss, y-number of heads. Compute e(X, Y)	**07**	**L3**	**CO2**
		Module – 3			
Q.5	**a.**	Define statistical hypothesis, null hypothesis, Type-I error and Type-II error.	**06**	**L1**	**CO4**
	b.	In 324 throws of a six faced die an even number turned up 181 times. Is it reasonable to think that the 'die' is an unbiased one at 99% level?	**07**	**L2**	**CO4**
	c.	Before an increase in excise duty on tea, 800 people out of sample of 1000 were consumers of tea. After the increase in duty, 800 people were consumers of tea in a sample of 1200 persons. Find whether there is significant decrease in the consumption of tea after the increase in duty at 1%. (One tailed test at 1% is 2.33).	**07**	**L3**	**CO4**
		OR			
Q.6	**a.**	A coin is tossed 1000 times and head turns up 540 times. Decide on the hypothesis that the coin is unbiased.	**06**	**L2**	**CO4**
	b.	In an exit poll enquiry it was revealed that 600 voters in one locality and 400 voters from another locality favoured 55% and 48% respectively a particular party to come to power. Test the hypothesis that there is a difference in the locality in respect of the opinion.	**07**	**L3**	**CO4**
	c.	A random sample for 1000 workers in company has mean wage of Rs.50 per day and standard deviation of Rs.15. Another sample of 1500 workers from another company has mean wage of Rs.45 per day and standard deviation of Rs.20. Does the mean rate of wages varies between the two companies at 95% confidence limit?	**07**	**L3**	**CO4**
		Module – 4			
Q.7	**a.**	The mean life time of a sample of 25 bulbs is found as 1550 hrs with standard deviation of 120 hours. The company manufacturing the bulbs claims that the average life of their bulbs is 1600 hrs. Is the claim acceptable at 5% level of significance?	**06**	**L3**	**CO4**
	b.	The two independent samples of eight and seven items respectively had the following values of the variable: Sample 1: 9, 11, 13, 11, 15, 9, 12, 14 Sample 2: 10, 12, 10, 14, 9, 8, 10 Do the two estimates of population variance differ significantly at 5% level of significance? F at 5% $(V_1 = 7, V_2 = 6) = 4.21$.	**07**	**L3**	**CO4**
	c.	Table gives the number of aircraft accidents that occurred during the various days of a week. Test whether the accidents are uniformly distributed over the week. $\chi^2_{5\%}(\gamma = 5) = 11.07$. Day: Mon, Tue, Wed, Thur, Fri, Sat Number of accidents: 15, 19, 13, 12, 16, 15	**07**	**L3**	**CO4**

OR

Q.8 **a.** Two random samples gave the following data: **06** **L2** **CO4**

	Size	Mean	Variance
Sample 1	8	9.6	1.2
Sample 2	11	16.5	2.5

Can we conclude that the two samples have been drawn from the same normal population? $F_{5\%}$ (10, 7) = 3.64.

b. The following data relate to the marks obtained by 11 students in two tests. Second test is after intense coaching. Do the data indicate that the students have benefited by coaching? **07** **L3** **CO4**

Test 1	19	23	16	24	17	18	20	18	21	19	20
Test 2	17	24	20	24	20	22	20	20	18	22	19

($t_{5\%}$ ($\gamma = 10$) is 1.81)

c. The mean value of a random sample of 60 items was found to be 145 and standard deviation is 40. Find the 95% confidence limits for the population mean. **07** **L2** **CO5**

Module – 5

Q.9 **a.** The following figures relate to production in kgs of three variables A, B, C of wheat sown on 12 plots. **10** **L3** **CO6**

A	14	16	18		
B	14	13	15	22	
C	18	16	19	19	22

Apply one-way Annova using a 0.05 significance level in the production of the varieties. F_c at 5% (2, 9) d.f is 4.26.

b. Analyze and interpret the following statistics concerning output of wheat per field obtained as a result of experiment conducted to test four varieties of wheat viz., A, B, C and D under a Latin - Square design. **10** **L3** **CO6**

C	B	A	D
25	23	20	20
A	D	C	B
19	19	21	18
B	A	D	C
19	14	17	20
D	C	B	A
17	20	21	15

OR

Q.10 **a.** Four doctors each test four treatments for a certain disease and observe the number of days each patient takes to recover. The results are as follows: **10** **L3** **CO6**

Doctor/Treatment	T_1	T_2	T_3	T_4
D_1	10	14	19	20
D_2	11	15	17	21
D_3	9	12	16	19
D_4	8	13	17	20

Discuss the difference between doctors and treatments F_{at} 5% level (3, 9) is 3.86.

b. A study of the effect of different types of anesthesia on the length of post-operative hospital stay yielded for the following for cesarean patients. Group 'A' was given an epidural MS providing additional safety. Group 'B' was given an epidural and Group 'C' was given a spinal is considered to be less dangerous and Group 'D' was given general anesthesia is considered to be the most dangerous. Note that the data are in the form of distribution for each group. **(10 | L3 | CO6)**

	Length of Stay	Number of patients
Group A	3	6
	4	14
Group B	4	18
	5	2
Group C	4	10
	5	9
	6	1
Group D	4	8
	5	12

Test for the existence of an effect due to anesthesia type at 0.01. $F_{0.01} = 4.13$

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCM301

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Mathematics for Computer and Communication Engineering

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. VTU Formula Hand Book is permitted.
3. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Obtain the Fourier series for the function $f(x)=\begin{cases}-\pi & -\pi<x<0\\ x & 0<x<\pi\end{cases}$ and hence deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+....$	8	L2	CO1
	b.	Find the half range cosine series of $f(x) = x^2$ in the range $0 \le x \le \pi$.	6	L2	CO1
	c.	The following table gives the variations of a periodic current 'A' over a certain period 'T'. t (sec) | 0 | T/6 | T/3 | T/2 | 2T/3 | 5T/6 | T A (amp) | 1.98 | 1.30 | 1.05 | 1.30 | –0.88 | –0.25 | 1.98 Show that there is a direct current part of 0.75 amp in the variable current and obtain first harmonic.	6	L3	CO1
		OR			
Q.2	a.	Find the Fourier series expansion of $f(x) = 2x - x^2$ in (0, 3)	8	L2	CO1
	b.	Find the half range cosine series of $f(x) = x(\ell - x)$, $0 < x < \ell$.	6	L2	CO1
	c.	Express y as a Fourier series upto first harmonic x | 0 | 1 | 2 | 3 | 4 | 5 y | 4 | 8 | 15 | 7 | 6 | 2	6	L3	CO1
		Module – 2			
Q.3	a.	Find the Fourier sine and cosine transform of $f(x) = e^{-ax}$, $a > 0$.	6	L2	CO2
	b.	Find the Fourier transform of $f(x)=\begin{cases}1-x^2, & \lvert x\rvert \le 1\\ 0, & \lvert x\rvert > 1\end{cases}$ and hence evaluate $\int_0^\infty \frac{x\cos x - \sin x}{x^3}dx$.	7	L3	CO2
	c.	Find Z-transform of coshnθ, cosnθ.	7	L2	CO2
		OR			
Q.4	a.	Find Fourier Transform of $e^{-\lvert x\rvert}$.	6	L2	CO2
	b.	Find $z_T^{-1}\left[\frac{3z^2+2z}{(5z-1)(5z+2)}\right]$	7	L3	CO2
	c.	Solve $y_{n+2}+6y_{n+1}+9y_n = 2^n$ with $y_0 + y_1 = 0$ using Z-transforms technique.	7	L3	CO2

		Module – 3			
Q.5	**a.**	Fit a curve of the form $y = ae^{bx}$ to the following data: x: 5, 15, 20, 30, 35, 40 y: 10, 14, 25, 40, 50, 62	**7**	**L2**	**CO3**
	b.	If θ is the acute angle between two regression lines relating the variables x and y. Show that $\tan\theta = \frac{1-r^2}{r}\left(\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}\right)$	**7**	**L3**	**CO3**
	c.	In a partially destroyed laboratory record, the lines of regression of 'y' on 'x' and 'x' on 'y' are available as $4x - 5y - 33 = 0$ and $20x - 9y = 107$. Calculate $\bar{x}$, $\bar{y}$ and 'r' between x and y.	**6**	**L3**	**CO3**
		OR			
Q.6	**a.**	Fit a parabola to the following data: x: 1, 2, 3, 4, 5 y: 2, 6, 7, 8, 10	**7**	**L2**	**CO3**
	b.	Compute the coefficient of correlation and regression lines for the data: x: 1, 2, 3, 4, 5, 6, 7 y: 9, 8, 10, 12, 11, 13, 14	**7**	**L3**	**CO3**
	c.	Find the rank correlation for the data: x: 56, 42, 72, 36, 63, 47, 55, 49, 38, 42, 68, 69 y: 147, 125, 160, 118, 149, 128, 150, 145, 115, 140, 152, 155	**6**	**L3**	**CO3**
		Module – 4			
Q.7	**a.**	A random variable X has the following probability function for various values of X. X: 0, 1, 2, 3, 4, 5, 6, 7 P(X): 0, K, 2K, 2K, 3K, K^2, $2K^2$, $7K^2 + K$ (i) Find K (ii) Evaluate $P(X < 6)$, $P(0 < X < 5)$, $P(X \geq 6)$	**6**	**L2**	**CO4**
	b.	Obtain the mean and variance of binomial distribution.	**7**	**L2**	**CO4**
	c.	In a test on 2000 electric bulbs. It was found that the life of a particular make was normally distributed with an average life of 2040 hours and S.D 60 hours. Estimate the number of bulbs likely to burn for: (i) More than 2150 hours (ii) Less than 1950 hours (iii) Between 1920 and 2160 hours	**7**	**L3**	**CO4**
		OR			
Q.8	**a.**	A random variable x has the density function, $P(x) = \begin{cases} Kx^2 & 0 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$. Find K also find $P(x \leq 1)$, $P(x > 1)$, $P(1 \leq x \leq 2)$.	**6**	**L2**	**CO4**
	b.	In a certain town the duration of a shower is exponentially distributed with mean 5 minutes. What is the probability that a shower will last for: (i) 10 minutes or more (ii) Less than 10 minutes (iii) between 10 to 12 minutes	**7**	**L3**	**CO4**
	c.	In a normal distribution 31% of the items are under 45 and 8% are over 65. Find mean and variance of the distribution.	**7**	**L3**	**CO4**

<table>
<tr><td colspan="6">Module – 5</td></tr>
<tr><td>Q.9</td><td>a.</td><td>If joint probability distribution of x and y is given by $f(x,y)=\frac{x+y}{30}$, for x = 0, 1, 2, 3; y = 0, 1, 2. Find:
(i) $P(x \le 2, y = 1)$ (ii) $P(x > 2, y \le 1)$ (iii) $P(x > y)$</td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>Define:
(i) Null hypothesis (ii) Alternate hypothesis
(iii) Type - 1 and Type - 2 Errors (iv) Significance level
(v) Critical region</td><td>6</td><td>L1</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>A random sample of Ten boys has the following I.Q.: 70, 120, 110, 101, 88, 83, 95, 98, 107, 100. Do the data supports the assumption of a population mean I.Q. of 100. (at 5% level of significance)</td><td>7</td><td>L3</td><td>CO5</td></tr>
<tr><td colspan="6">OR</td></tr>
<tr><td>Q.10</td><td>a.</td><td>The joint probability distribution of two random variables x and y is
<table>
<tr><td>y \ x</td><td>–4</td><td>2</td><td>7</td></tr>
<tr><td>1</td><td>$\frac{1}{8}$</td><td>$\frac{1}{4}$</td><td>$\frac{1}{8}$</td></tr>
<tr><td>5</td><td>$\frac{1}{4}$</td><td>$\frac{1}{8}$</td><td>$\frac{1}{8}$</td></tr>
</table>
i) Find marginal probability distribution
ii) Obtain the correlation coefficients between x and y</td><td>7</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>b.</td><td>In 324 throws of a die an odd number turned up 181 times. Is it reasonable to think that the die is an unbiased one? Use 5% and 1%.</td><td>6</td><td>L2</td><td>CO5</td></tr>
<tr><td></td><td>c.</td><td>Five dice were thrown 96 times and the number 1, 2 or 3 appearing on the face of the dice follows the frequency distribution as below:
<table>
<tr><td>Number of dice showing 1, 2, or 3</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>Frequency</td><td>7</td><td>19</td><td>35</td><td>24</td><td>8</td><td>3</td></tr>
</table>
Test the hypothesis that the data follows binomial distribution at 5% level of significance.</td><td>7</td><td>L3</td><td>CO5</td></tr>
</table>

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCS302

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Digital Design and Computer Organization

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Reduce the following Boolean expressions to the minimum number of literals. i) $x(x' + y)$ ii) $x + x'y$ iii) $(x + y)(x + y')$ iv) $xy + x'z + yz$ v) $(x + y)(x' + z)(y + z)$	10	L3	CO1
	b.	Determine the minimum SOP form using Karnaugh Map $F = A'B'C' + B'CD' + A'BCD' + AB'C'$.	10	L3	CO1
		OR			
Q.2	a.	Simplify the Boolean function $F(w, x, y, z) = \Sigma(1, 3, 7, 11, 15)$ which has the don't care conditions $d(w, x, y, z) = \Sigma(0, 2, 5)$	10	L3	CO1
	b.	Simplify and implement the following Boolean function using NAND gates $F(x, y, z) = (1, 2, 3, 4, 5, 7)$.	10	L3	CO1
		Module – 2			
Q.3	a.	Implement the design of combinational circuit BCD and excess 3 code converter.	10	L2	CO2
	b.	Implement full adder circuit using 3:8 decoders.	10	L2	CO2
		OR			
Q.4	a.	With Truth table and K-map simplification, implement the full adder with basic gates and using two half adders an OR gate.	10	L2	CO2
	b.	Realize the Boolean function using 8:1 multiplexer $F(A, B, C, D) = \Sigma(1, 3, 4, 11, 12, 13, 14, 15)$.	10	L2	CO2
		Module – 3			
Q.5	a.	Explain Bus structure with diagram, explain how different peripherals connected to the bus.	10	L2	CO3
	b.	Explain in detail about the word alignment of a machine (microprocessor based systems) what is the consecutive addresses of aligned words for 16, 32 and 64 bit word length of the machine? Give consecutive address for each of the following specified above.	10	L2	CO3
		OR			
Q.6	a.	Write a note on : i) Register Transfer Notation (RTN) ii) Assembly Language Notation.	10	L2	CO3

	b.	Illustrate an indexed addressing mode with a assembly language program to find the sum of the Test 1, Test 2 and Test 3 scores of the N number of students.	10	L2	CO3
		Module – 4			
Q.7	a.	Explain Hardware interrupt, enabling/disabling of interrupts and sequence of events in handling interrupt request from a single device.	10	L2	CO4
	b.	Explain memory mapped I/O and I/O interface for an input device with a diagram.	10	L2	CO4
		OR			
Q.8	a.	Describe DMA with its register and controllers.	10	L2	CO4
	b.	Explain the effect of size, cost and speed in memory Hierarchy.	10	L2	CO4
		Module – 5			
Q.9	a.	Explain the process of Fetching word from memory in processor.	10	L2	CO5
	b.	With a diagram, explain the single bus organization of the data path inside a processor.	10	L2	CO5
		OR			
Q.10	a.	Describe how an ALU perform on arithmetic and logic operation along with input gating diagrams.	10	L2	CO5
	b.	Explain the complete set of operations involved in executing the instruction Add (R_3) R^1 along with control sequence.	10	L2	CO5

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCS303

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Operating Systems

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Explain multi programming and time sharing systems.	07	L3	CO1
	b.	Explain the dual mode operation in operating systems with a neat block diagram.	07	L3	CO1
	c.	What are virtual machines? Explain with a neat figure.	06	L3	CO1
		OR			
Q.2	a.	What are system calls? Briefly explain different types of system calls.	07	L3	CO1
	b.	List and explain the services provided by OS for the user in efficient operation of a system.	07	L3	CO1
	c.	What are micro kernels? With a neat figure, explain the micro kernel structure? Point out their advantages over layered approach.	06	L3	CO1
		Module – 2			
Q.3	a.	What is process? Explain different states of the process with state transition diagram and process control block.	08	L2	CO2
	b.	What is Interprocess communication? Explain.	06	L2	CO2
	c.	What is thread? How it is different from process? Discuss various multithreading models with suitable illustration.	06	L2	CO2
		OR			
Q.4	a.	Consider the following processes where smaller the number has higher priority. Draw the Gantt chart compute the waiting time and average turnaround time by using FCFS, SRTF, preemptive priority scheduling.	12	L2	CO2
	b.	Discuss the benefits of multithreaded programming. Explain the threading issues in detail.	08	L2	CO2
		Module – 3			
Q.5	a.	What are the requirements that must be satisfied by a solution to the critical section problem? Illustrate with an example the Peterson's solution for critical section problem.	08	L3	CO3
	b.	What is critical section problem and solutions to the problem? How to solve using semaphores?	06	L3	CO3
	c.	Explain the classical bounded buffer problem of synchronization. Give the solution	06	L3	CO3
		OR			
Q.6	a.	What is dead lock? What are the necessary conditions for the deadlock to occur? How to recover from deadlocks.	10	L3	CO3

Processes	Arrival times	Burst time	Priority
P_1	0	7	4
P_2	3	5	2
P_3	3	3	6
P_4	5	5	3

	b.	Assume that there are 5 processes P_0 to P_4 and 4 types of resources. At time T_0 the system has following: Apply the bankers algorithm to answer following: (i) What is the content of need matrix? (ii) Is the system in a safe state? (iii) If the request from P_1(2, 1, 1, 0) arrives can it be granted?	10	L3	CO3

Processes	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	1	1	0	0	2	1	0	1	3	1	0
P_1	1	4	4	1	1	6	5	2				
P_2	1	3	6	5	2	3	6	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Module – 4

Q.7	**a.**	What is paging? Differentiate between paging and segmentation.	**06**	**L3**	**CO4**
	b.	What are TLB? Explain TLB in detail with a simple paging system and neat diagram.	**08**	**L3**	**CO4**
	c.	Given the memory partitions of 100K, 500K, 200K, 300K and 600K, apply first fit, best fit and worst fit algorithms to place 212K, 417K, 112K and 426K.	**06**	**L3**	**CO4**
		OR			
Q.8	**a.**	What is page fault? With a neat diagram, explain the steps in handling page fault.	**08**	**L3**	**CO4**
	b.	Illustrate how demand paging affects system performance. What is thrashing how it can be controlled?	**06**	**L3**	**CO4**
	c.	Consider the following sequence: 7, 0, 1, 2, 0, 3, 0, 4, 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1 Assuming frame size of 4, apply LRU, FIFO and optimal algorithm to find the page faults. Find out which algorithm is most efficiency.	**06**	**L3**	**CO4**
		Module – 5			
Q.9	**a.**	Explain various file attributes and operations of files.	**06**	**L3**	**CO5** **CO6**
	b.	With a neat diagram, explain two level and tree structured directory structure.	**08**	**L3**	**CO5** **CO6**
	c.	What is file? Explain the file mounting.	**06**	**L3**	**CO5** **CO6**
		OR			
Q.10	**a.**	Give the following sequence: 95, 180, 34, 119, 11, 123, 62, 64 with the head initially at 50 and ending at track 199. What is the total disk travelled by the disk drum to satisfy request using FCFS, SSTF, LOOK and CLOOK algorithms.	**12**	**L3**	**CO5** **CO6**
	b.	Explain the access matrix model of implementing protection on OS.	**08**	**L3**	**CO5** **CO6**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCS304

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Data Structures and Applications

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	What is data structure? List and explain data structure operations.	08	L2	CO1
	b.	Discuss four dynamic memory allocation functions.	08	L2	CO1
	c.	With suitable example, discuss self-referential structures.	04	L2	CO1
		OR			
Q.2	a.	What is sparse matrix? Give the triplet form for given matrix and also find its transpose.	06	L3	CO2
	b.	Explain ADT stack.	07	L2	CO2
	c.	Define Stack. Implement the operations of stack using arrays.	07	L1	CO2
		Module – 2			
Q.3	a.	What is the advantage of circular queue over ordinary queue? Discuss the implementation of circular queue operations.	08	L2	CO2
	b.	Demonstrate multiple stacks and queues with suitable examples.	12	L2	CO2
		OR			
Q.4	a.	Explain Linked Stacks and Queues operations.	10	L2	CO2
	b.	Give the C functions for the following on singly linked list with example: i) Insert a node at the beginning ii) Delete a node at the front iii) Display	10	L3	CO3
		Module – 3			
Q.5	a.	Define linked list? Implement C function for the following circular Doubly linked list: i) Insert a node at the beginning ii) Delete a node at the end iii) Display	10	L3	CO3
	b.	Develop a function to delete a node whose information field is specified in singly linked list.	10	L3	CO3
		OR			
Q.6	a.	What is a tree? With suitable example, define i) Complete binary tree ii) Degree of the tree iii) Level of a node	07	L2	CO4
	b.	List and explain representation of a binary tree?	07	L2	CO4
	c.	Explain In-threaded binary tree.	06	L2	CO4

A =

	0	1	2	3
0	10	0	0	40
1	11	0	22	0
2	0	0	0	0
3	20	0	0	50
4	0	15	0	25

		Module – 4			
Q.7	**a.**	For the given data, draw a binary search tree. 100, 85, 45, 55, 110, 20, 70, 65	**07**	**L3**	**CO4**
	b.	List and explain the common operations of binary search tree.	**07**	**L2**	**CO4**
	c.	Explain about forests.	**06**	**L2**	**CO2**
		OR			
Q.8	**a.**	Define graph. Explain graph abstract data types.	**10**	**L2**	**CO4**
	b.	Explain the elementary graph operations.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Define hashing. Explain types of hashing functions in detail.	**10**	**L2**	**CO5**
	b.	Explain static hashing and dynamic hashing in detail.	**10**	**L2**	**CO5**
		OR			
Q.10		Write a short note on :			
	a.	Leftist trees	**06**	**L2**	**CO4**
	b.	Optimal binary search tree	**07**	**L2**	**CO5**
	c.	Priority queues	**07**	**L2**	**CO2**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

BCS306A

Third Semester B.E./B.Tech. Degree Examination, June/July 2024
Object Oriented Programming with Java

Time: 3 hrs. Max. Marks: 100

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	M	L	C
Q.1	a.	Differentiate two paradigms of programming.	5	L2	CO1
	b.	Explain the various bitwise and short circuit operators in Java.	8	L2	CO1
	c.	Write a Java program with a method to check whether a given number is prime or not.	7	L3	CO1
		OR			
Q.2	a.	Explain various scopes of variables in Java.	5	L2	CO1
	b.	Explain the arithmetic compound assignment and Ternary operators in Java.	8	L2	CO1
	c.	Write a Java program to perform linear search on an array elements accepted from keyboard and key element also accepted from key board.	7	L3	CO1
		Module – 2			
Q.3	a.	Explain method overloading in Java with examples.	8	L2	CO2
	b.	Design a stack class to hold maximum of N numbers with a constructor, push, POP and Display methods. Develop Java main method to illustrate stack operations.	12	L3	CO2
		OR			
Q.4	a.	Explain the role of "this" keyword and "static" keyword in Java.	8	L2	CO2
	b.	Design a class called "Employee" with fields ID, Name and Salary. Write a suitable constructors a method to raise salary and a static method to display. The number of Employee objects. Write suitable Main method for illustration.	12	L3	CO2
		Module – 3			
Q.5	a.	Explain the role of "Super" with example Java program.	6	L2	CO3
	b.	For any class and any method as an example, explain method overriding.	5	L2	CO3
	c.	Develop a Java program to create class called "Shape". Create 3 sub classes : circle, triangle and square. Each class has 2 member function area ( ) and draw ( ). Demonstrate polymorphism with a suitable main program.	9	L3	CO3
		OR			
Q.6	a.	Explain the order of constructor execution in a multilevel class hierarchy.	6	L2	CO3
	b.	Define dynamic method dispatch and write a code snippet in Java to demonstrate.	5	L1	CO3

	c.	Develop Java program to create interface Resizable with methods resize width (int width) and resize height (int height) that allow object to be resized. Create a class Rectangle that implements This Interface.	9	L3	CO3
		Module – 4			
Q.7	a.	Explain four categories of visibility for class members based on packages.	6	L2	CO4
	b.	Give the general form of an exception handling block and write a Java program to illustrate multiple catch classes.	7	L2	CO4
	c.	Write a custom exception in Java called "less marks" and raise This exception when marks entered by valuator in the range [30 – 34]	7	L3	CO4
		OR			
Q.8	a.	With code snippets, explain mechanism to create and import a package in Java.	6	L2	CO4
	b.	Write a Java program to create chained exceptions with top-level exception is Null Pointer Exception and its cause Arithmetic Exception.	7	L3	CO4
	c.	Develop a Java program to create custom exception for Negative odd numbers.	7	L3	CO4
		Module – 5			
Q.9	a.	Explain various methods of thread class in Java.	6	L2	CO5
	b.	Write a Java program to create 4 threads and each thread when run, will sleep for 500 milliseconds and print its name before "Before Quitting".	8	L3	CO5
	c.	Explain the use of Type wrappers in Java with example.	6	L2	CO5
		OR			
Q.10	a.	Explain is Alive ( ) and join ( ) methods of Thread with example code snippet.	6	L2	CO5
	b.	Write a Java program to create 4 Rread and each Thread generates random number and prints it and sleeps for 800 msec and quits.	8	L3	CO5
	c.	Explain the concept of autoboxing /unboxing in expressions and methods.	6	L2	CO5

* * * * *