USN : 4 C.S/Q.P/Rs. 60/- Course Code : 18CS42

Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021

OPERATING SYSTEM

Time: 3 hrs Max. Marks :100

Instructions : 1. Answer any five full questions.

L CO PO M

1a. What is the need of an operating system ? Explain the four components of a computer system with a neat diagram. [2] [1] [1] [6]

1b. Define system call ,explain different types of system calls with 2 examples for each. [2] [1] [1] [8]

1c. Explain any 6 features of UNIX Operating System. [2] [1] [1] [6]

2a. Define operating system, illustrate the Dual mode operation of an operating system. [2] [1] [1] [6]

2b. Explain different services provided by an operating system. [2] [1] [1] [8]

2c. Explain the structure of any Three internal/ external UNIX commands and illustrate their use. [2] [1] [1] [6]

3a. Define a process. With the help of a neat diagram explain the Process Control Block. [2] [2] [1] [6]

3b. Calculate the average waiting times for the given processes using preemptive SJF and Non-preemptive SJF scheduling algorithms. Draw the neat Gantt Chart for both.

Process	Arrival time	CPU burst time(ms)
P1	0	8
P2	1	4
P3	2	9
P4	3	5

[4] [2] [1, 2] [8]

3c. Explain Priority Scheduling Algorithm with its advantages and disadvantages. [2] [2] [1] [6]

4a. With the help of a neat diagram explain the Process State Diagram. [2] [2] [1] [6]

4b. Consider the following set of Processes, with their CPU Burst in milliseconds.

Process	Burst Time
P1	8
P2	10
P3	9
P4	5

1.Draw the Gantt Chart by applying SJF and Round Robin (time Quantum=5 ms) scheduling algorithms.

2.Calculate average waiting time and average turn around time for both the scheduling algorithms. [4] [2] [1, 2] [8]

4c. Explain different scheduling criteria that must be kept in mind while choosing scheduling algorithms [2] [2] [1] [6]

5a. What is Race condition? Explain the general structure of a process while solving Critical section problem.

[2] [2] [1] [6]

5b. What is a critical section problem? Explain the Peterson's solution.

[2] [2] [1] [8]

5c. Explain the necessary conditions that are required for the occurrence of Deadlocks?

[2] [2] [1] [6]

6a. Define Semaphores along with its implementation.

[2] [2] [1] [6]

6b. A system consists of five processes and three resource types (A, B, C). Resource type A has 10 instances, B has 5 instances abd C has 7 instances. The following snapshot of the system has been taken:

	Allocation			Max			Available		
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Compute the Need matrix, and Analyze the system for the safe sequence by using Banker's algorithm. Mention whether the above system is safe or not.

[4] [2] [2] [8]

6c. Illustrate the Dining Philosopher's problem of process synchronization with a neat diagram.

[2] [2] [1] [6]

7a. What is paging? Explain the hardware support for paging using TLB with a neat diagram.

[2] [3] [1] [10]

7b. For the following reference string, determine the page faults that occur using FIFO and LRU page replacement algorithms for 3 and 4 page frames.
Reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

[4] [3] [1, 2] [10]

8a. With a block diagram explain the process of swapping of two processes in memory.

[2] [3] [1] [10]

b. For the following reference string, determine the page faults that occur using LRU and Optimal page replacement algorithms for 3 and 4 page frames.Reference string: 7, 0, 1, 2, 0, 3, 0, 4 , 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1.

[4] [3] [1] [10]

9a. Explain the file attributes and file operations, briefly.

[2] [4] [1] [10]

9b. Explain file mounting with an example.

[2] [4] [1] [10]

10a. List and explain the different file access methods.

[2] [4] [1] [10]

10b. Explain the different types of directory structures, with examples and mention their advantages and disadvantages.

[2] [4] [1] [10]

USN : _____ Course Code : 16CS42

Fourth Semester B.E Semester End Examination, OCTOBER 2020

OPERATING SYSTEM

Time: 3 hrs Max. Marks :100

Instructions :1. Answer any Five full Questions selecting at least One Full Question from Each Unit. 2. Each Question carry Equal Marks. 3. Missing Data may be suitably assumed. 4. Draw Figures wherever necessary.

MODULE 1 L CO PO M

1a. Define operating system, illustrate the Dual mode operation of an operating system.

[1] [1] [1] [6]

1b. With a neat diagram explain the layered approach of operating system design with its advantages and disadvantages.

[2] [1] [1] [8]

1c. Explain the structure of a UNIX command and illustrate the use of following internal and external commands.
echo b. type c.pwd d. ls

[2] [1] [1] [6]

OR

2a. Explain the different services provided by an operating system.

[2] [1] [1] [8]

2b. Define system call, list out different types of system calls with 2 examples for each.

[1] [1] [1] [6]

2c. Explain any 6 features of UNIX Operating System.

[2] [1] [1] [6]

MODULE 2

3a. Compare and contrast pre-emptive and non-pre-emptive scheduling, with suitable examples

[4] [4] [1] [6]

3b. Consider the following set of processes, with the length of the CPU burst given in milliseconds:

Process	Arrival Time (ms)	Burst Time (ms)
P1	0	5
P2	1	3
P3	2	3
P4	4	1

For these processes, demonstrate the working of preemptive SJF algorithm.

1. Draw the Gantt chart.
2. Calculate the average waiting time

Calculate the average turnaround time

[5] [2] [2] [9]

3c. Discuss ps, the Process status command of UNIX operating system in detail

[4] [2] [1] [5]

OR

4a. Discuss various scheduling criteria for comparing CPU-scheduling algorithms

[2] [2] [1] [6]

4b. Consider the following set of processes, with the length of the CPU burst given in milliseconds (Assume that all processes arrived at time 0 ms.:

Process	Burst Time (ms)
P1	10
P2	29
P3	3
P4	7
P5	12

For these processes, demonstrate the working of FCFS, SJF and RR (quantum = 10 ms).

1.Draw the Gantt chart.
2.Calculate the average waiting time
Calculate the average turnaround time

[5] [2] [2] [9]

4c. What is a process? How a process is created in UNIX?

[2] [4] [1] [5]

MODULE 3

5a. Explain the critical section problem and also the Peterson's solution to overcome the same .

[2] [2] [1] [10]

5b. Define Semaphores along with its usage.

[1] [1] [1] [6]

5c. Define Deadlock, which are the methods for handling Deadlocks?

[1] [1] [1] [4]

OR

6a. Illustrate the classic Bounded-Buffer and Readers-Writers problem in process synchronization.

[2] [2] [1] [10]

6b. A system consists of five processes and three resource types (A, B, C). Resource type A has 10 instances, B has 5 instances abd C has 7 instances. The following snapshot of the system has been taken:

	Allocation			Max			Available		
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Find the Need matrix, and Analyze the system for the safe sequence by using Banker's algorithm. Mention whether the above system is safe or not.

[4] [2] [1, 2] [10]

MODULE 4

7a. Define page fault. Illustrate, with a neat diagram the steps in handling a page faults.

7b. For the following reference string, determine the page faults that occur using FIFO and LRU page replacement algorithms for 3 and 4 page frames.
Reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

[2] [3] [1] [10]

OR

8a. Explain the hardware support for paging with a neat diagram.

[5] [3] [1, 2] [10]

[2] [3] [1] [6]

8b. For the following reference string, determine the page faults that occur using LRU and Optimal page replacement algorithms for 3 and 4 page frames.
Reference string: 7, 0, 1, 2, 0, 3, 0, 4 , 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

[5] [3] [1, 2] [10]

8c. Briefly explain the two methods to solve the problem of external fragmentation

[2] [3] [1] [4]

MODULE 5

9a. Explain the file attributes and file operations briefly.

[2] [4] [1] [10]

9b. Explain the different types of directory structures, with examples and mention their advantages and disadvantages

[2] [4] [1] [10]

OR

10a. Define file, list and explain the different file access methods.

[1] [4] [1] [10]

10b. Illustrate file system mounting and file protection in the system.

[2] [4] [1] [10]

USN : 4th CS/IS-S/R-20 | Course Code : 18CS42

Fourth Semester B.E Makeup Examination, Sept._Oct._2020

OPERATING SYSTEM

Time: 3 hrs | Max. Marks :100

Instructions :1. Answer any Five full Questions selecting at least One Full Question from Each Unit. 2. Each Question carry Equal Marks. 3. Missing Data may be suitably assumed. 4. Draw Figures wherever necessary.

MODULE 1 | L | CO | PO | M

1a. Define operating system, illustrate the Dual mode operation of an operating system. [1] [1] [1] [6]

1b. With a neat diagram explain the layered approach of operating system design with its advantages and disadvantages. [2] [1] [1] [8]

1c. Explain the structure of a UNIX command and illustrate the use of following internal and external commands.
echo b. type c.pwd d. ls [2] [1] [1] [6]

OR

2a. Explain the different services provided by an operating system. [2] [1] [1] [8]

2b. Define system call, list out different types of system calls with 2 examples for each. [1] [1] [1] [6]

2c. Explain any 6 features of UNIX Operating System. [2] [1] [1] [6]

MODULE 2

3a. Compare average waiting time and average turnaround time for the given processes using SJF (Non-preemptive) and FCFS scheduling algorithms.

Process	Burst Time	Arrival Time
P1	10	0
P2	1	1
P3	2	2
P4	1	3
P5	5	4

[4] [2] [2] [8]

3b. With the help of a neat diagram explain context switching. [2] [2] [2] [6]

3c. Explain Round-Robin scheduling algorithm with its advantages ,disadvantages and an example. [2] [2] [1] [6]

OR

4a. With the help of a neat diagram explain the Process State Diagram. [2] [2] [1] [6]

4b. Consider the following set of processes with Arrival Time and CPU Burst Time in milliseconds.
Apply SRTF and FCFS algorithms. Draw Gantt Charts and compare the Average Waiting Time and Average Turn Around Time.

Process	Arrival Time	Burst Time
P1	0	12
P2	1	5
P3	2	7
P4	3	6
P5	4	3

[3] [2] [1] [8]

4c. Explain different scheduling criteria that must be kept in mind while choosing scheduling algorithms. [2] [2] [1] [4]

MODULE 3

5a. Explain the critical section problem and also the Peterson's solution to overcome the same.

[2] [2] [1] [10]

5b. Define Semaphores along with its usage.

[1] [1] [1] [6]

5c. Define Deadlock, which are the methods for handling Deadlocks?

[1] [1] [1] [4]

OR

6a. Illustrate the classic Bounded-Buffer and Readers-Writers problem in process synchronization.

[2] [2] [1] [10]

6b. A system consists of five processes and three resource types (A, B, C). Resource type A has 10 instances, B has 5 instances abd C has 7 instances. The following snapshot of the system has been taken:

	Allocation			Max			Available		
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	?	?	?			
P4	0	0	2	4	3	3			

Find the Need matrix, and Analyze the system for the safe sequence by using Banker's algorithm. Mention whether the above system is safe or not.

[4] [2] [1, 2] [10]

MODULE 4

7a. Define page fault. Illustrate, with a neat diagram the steps in handling a page faults.

[2] [3] [1] [10]

7b. For the following reference string, determine the page faults that occur using FIFO and LRU page replacement algorithms for 3 and 4 page frames.
Reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

[5] [3] [1, 2] [10]

OR

8a. Explain the hardware support for paging with a neat diagram.

[2] [3] [1] [6]

8b. For the following reference string, determine the page faults that occur using LRU and Optimal page replacement algorithms for 3 and 4 page frames.
Reference string: 7, 0, 1, 2, 0, 3, 0, 4 , 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

[5] [3] [1, 2] [10]

8c. Briefly explain the two methods to solve the problem of external fragmentation

[2] [3] [1] [4]

MODULE 5

9a. Explain the file attributes and file operations briefly.

9b. Explain the different types of directory structures, with examples and mention their advantages and disadvantages

[2] [4] [1] [10]

OR

[2] [4] [1] [10]

10a. Define file, list and explain the different file access methods.

10b. Illustrate file system mounting and file protection in the system.

[1] [4] [1] [10]

[2] [4] [1] [10]

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16CS/IS42

Fourth Semester B.E. Semester End Examination, May/June 2018-19

OPERATING SYSTEM

Time: 3 Hours | Max. Marks: 100

Instructions: 1. *Unit -I and Unit-III are compulsory*
2. *Answer any one full question from each of the remaining units*

UNIT – I (Compulsory)

			L	CO	PO	M
1	a.	Define an Operating system? List and explain the different services provided by an operating system	(2)	(1)	(1)	(10)
	b.	Construct a sequence of system calls to transfer contents from one file to another. Explain layered approach with a neat diagram	(2)	(1)	(2)	(10)

UNIT – II

			L	CO	PO	M
2	a.	With a neat process state transition diagram, explain the different states of a process.	(3)	(1)	(1)	(07)
	b.	Consider the following set of processes with Arrival Time and CPU Burst Time in milliseconds.				

Process	Arrival Time	Burst Time
P1	0	10
P2	1	5
P3	2	7
P4	3	6

Apply SJF and Round Robin algorithms. Consider time quantum for Round Robin algorithm is 4 milliseconds. Draw Gantt Chart. Compute and compare the Average Waiting Time and Average Turn Around Time.

(4) (2) (4) (10)

c. Explain three requirements for critical section problem.

(2) (2) (1) (03)

OR

3	a.	Explain any four Scheduling Criteria for CPU Scheduling Algorithms.	(2)	(2)	(1)	(04)
	b.	What is PCB? Explain its components.	(2)	(2)	(1)	(08)
	c.	Illustrate the Readers-Writers problem and provide a solution using semaphores.	(2)	(2)	(1)	(08)

UNIT – III (Compulsory)

			L	CO	PO	M
4	a.	Define deadlock. What are the necessary conditions for deadlock to occur? Indicate how many of these should occur for deadlock to happen?	(2)	(3)	(1)	(10)
	b.	Solve the following snapshot using Banker's algorithm.				

Process	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P_0	0	0	2	0	0	4	1	0	2
P_1	1	0	0	2	0	1			
P_2	1	3	5	1	3	7			
P_3	6	3	2	8	4	2			
P_4	1	4	3	1	5	7			

i) Is the system in safe state?
ii) If a request from process P_2 arrives for (0,0,2), can the request be granted immediately?

(3) (3) (2) (10)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

			L	CO	PO	M
		UNIT - IV				
5	a.	What is Demand Paging? Explain the steps involved in handling page fault with diagram	(2)	(3)	(1)	(1
	b.	Given memory partitions of 100k, 500k, 200k and 600k (in order). Which algorithm from best worst fit and first fit places processes with requirements 212k, 417k, 112k and 426 k in an effici manner?	(3)	(3)	(2)	(1
		OR				
6	a.	Discuss Paging with neat diagrams.	(2)	(3)	(1)	(1
	b.	Apply FIFO and LRU Page Replacement algorithms for page frames size 3 and find the page fau for the following string: 5, 4, 3, 2 , 1 , 4 , 3 , 5 , 4 , 3 , 2 , 1 , 5	(3)	(3)	(2)	(1
		UNIT -V	L	CO	PO	M
7	a.	What is a file? List and explain the various file attributes and file operations.	(2)	(3)	(1)	(1
	b.	Discuss Remote File Systems in detail.	(2)	(3)	(1)	(1
		OR				
8	a.	Discuss the different access methods in detail.	(2)	(3)	(1)	(1
	b.	Explain the following directory structures with an example. i) single- level directory ii) two-level directory ii) three-structured directories	(2)	(3)	(1)	(1

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16CS42

Fourth Semester B.E. Makeup Examination, May/June 2018-19

OPERATING SYSTEM

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *UNIT I and UNIT III are compulsory.*
2. *Answer any five full questions from the remaining units*

UNIT – I (Compulsory)

			L	CO	PO	M
1	a.	Define Operating System. Explain the different operating system services which are provided for the convenience of the programmer and also ensuring the efficient operation of the system itself.	(2)	(1)	(1)	(10)
	b.	Discuss multiprocessor system with advantages.	(2)	(1)	(1)	(05)
	c.	List the activities of operating system with respect to process management and file management.	(1)	(1)	(1)	(05)

UNIT – II

			L	CO	PO	M
2	a.	Explain the concept of scheduling queues with a neat diagram along with the different types of schedulers.	(2)	(2)	(1)	(10)
	b.	Compare average waiting time and average turnaround time for the processes given in the below figure using i) FCFS ii) Preemptive SJF Scheduling algorithms.				

Process	Arrival time(ms)	CPU Burst time(ms)
P1	0	8
P2	1	4
P3	2	9
P4	3	5

(4) (2) (2) (10)

OR

3	a.	What are semaphores? Illustrate the Dinning- Philosophers problem and provide a solution using semaphores.	(2)	(2)	(1)	(10)
	b.	Compare average waiting time and average turnaround time for the processes given in the below figure using i) FCFS ii) Preemptive priority (low value indicates high priority) scheduling algorithms.				

Process	Arrival time(ms)	CPU Burst time(ms)	Priority
P1	0	7	3
P2	2	3	2
P3	2	8	1
P4	3	4	4

(4) (2) (2) (10)

UNIT – III (Compulsory)

			L	CO	PO	M
4	a.	What is deadlock. Explain the necessary conditions for deadlocks.	(2)	(2)	(1)	(04)

b. A system consists of five processes and three resource types (A,B,C) . Resource type A has 10 instances, B has 5 instances, and C has 7 instances. The following snapshot of the system has been taken.

Process	Allocation			Max			Available		
	A	B	C	A	B	C.	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Find the need matrix , and analyze the system for the safe sequence by using Banker's algorithms. Mention whether the above system is safe or not.

(4) (2) (4) (10)

c. Explain the necessary conditions to prevent the occurrence of a deadlock.

(2) (2) (2) (06)

L CO PO M

UNIT - IV

5 a. Explain the difference between internal fragmentation and external fragmentation. Discuss the solutions for external fragmentation.

(2) (3) (1) (04)

b. Explain with diagram the Compile time, Load time, and Execution time address binding for multistep processing of a user program.

(2) (3) (1) (06)

c. Consider the following reference string.
7 0 1 2 0 3 0 4 2 3 0 3 2 1 2 0 1 7 0 1 for a memory with three frames. How many page faults occur for LRU, FIFO page replacement algorithms.? Compare and comment on the efficiency of algorithm.

(4) (3) (1) (10)

OR

6 a. Discuss the following terms: i) Swapping ii) Continuous memory allocation.

(2) (3) (1) (10)

b. What is Translation Look-aside Buffer(TLB)? Explain with diagram paging hardware with TLB.

(2) (3) (1) (10)

UNIT - V

L CO PO M

7 a. Explain with diagram sequential file access method Vs Direct access method.

(2) (3) (2) (12)

b. Explain the layered design of a file system.

(2) (3) (1) (08)

OR

8 a. What is a file? List and explain the various File Attributes and file operations.

(2) (3) (1) (10)

b. Explain the different types of directory structure with examples and mention their advantages and disadvantages.

(2) (3) (1) (10)

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

CS/IS42/16CS/IS42

Fourth Semester B.E. Semester End Examination, May / June 2018

OPERATING SYSTEM

Time: 3 Hours Max. Marks: 100

Instructions: 1. *Unit I and III are compulsory.*
2. *Answer any one question from remaining Units.*

UNIT – I

1 a. List and explain the different services provided by an operating system **08 M**
(Level [1, 2], CO [1], PO [1])

b. List a sequence of system calls to transfer contents from one file to another. **06 M**
(Level [1], CO [1], PO [1,2])

c. What is a Virtual Machine? With a neat diagram explain its working and benefits. **06 M**
(Level [2], CO [1], PO [1,2])

UNIT – II

2 a. With a neat process state diagram explain the different states of a process. **06 M**
(Level [3,2], CO [1], PO [1])

b. Consider the following set of Processes and CPU Burst time in ms **08 M**

Process	Burst time
P1	6
P2	8
P3	7
P4	3

Apply SJF and FCFS algorithms and compute average waiting time in both the cases.
(Level [3], CO [2], PO [2])

c. Explain the benefits of multithreaded programming. **06 M**
(Level [2], CO [2], PO [1])

OR

3 a. Consider the following set of Processes and CPU Burst time in milliseconds and time quantum of 4ms **08 M**

Process	Burst time
P1	24
P2	3
P3	3

Apply SJF and Round robin scheduling algorithm and compute average waiting time.
(Level [3], CO [2], PO [2])

b. What is critical section of a process? Explain the requirements to satisfy critical-section problem. **06 M**
(Level [2,3], CO [2], PO [1])

c. What is semaphore? Write the definition of wait() and signal() operations. **06 M**
(Level [1,3], CO [2], PO [1])

UNIT – III

4 a. What are deadlocks and what are its necessary conditions. **04 M**
(Level [1], CO [3], PO [1])

b. A system consists of five processes and three resource types (A, B, C). Resource type A has 10 instances, B has 5 instances and C has 7 instances. The following snapshot of the system has been taken: 10 M

	Allocation			Max			Available		
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Find the Need matrix, and Analyze the system for the safe sequence by using Banker's algorithm. Mention whether the above system is safe or not.

(Level [4], CO [3], PO [1,4])

c. Briefly explain the methods for deadlock prevention. 06 M

(Level [2], CO [3], PO [1])

UNIT – IV

5 a. With a block diagram explain the process of swapping of two processes in memory. 07 M

(Level [2], CO [3], PO [1])

b. What is paging? With a block diagram explain hardware support for paging. 08 M

(Level [1,2], CO [3], PO [1])

c. Explain hashed paged tables. 05 M

(Level [2], CO [3], PO [1])

OR

6 a. With Diagram explain the procedure for handling page fault. 10 M

(Level [2], CO [4], PO [1])

b. Consider reference string 10 M
7,0,1,2,0,3,0,4,2,3,0,3,2,1,2,0,1,7,0,1 and 3 frames.
Apply optimal page replacement algorithm and find the number of page faults.

(Level [3], CO [3], PO [2])

UNIT – V

7 a. Explain the file attributes and file operations, briefly. 10 M

(Level [2], CO [5], PO [1])

b. Explain the different types of directory structures, with examples and mention their advantages and disadvantages. 10 M

(Level [2], CO [5], PO [1])

OR

8 a. List and explain the different file access methods. 10 M

(Level [2], CO [5], PO [1])

b. Explain the file system mounting with the help of a neat sketch and discuss the issues of file sharing and protection. 10 M

(Level [2], CO [5], PO [1])

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

16CS42

Fourth Semester B.E. Makeup Examination, June 2018
OPERATING SYSTEM

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *UNIT I and III are Compulsory questions*
2. *Answer any Full Questions from the remaining UNITS*

UNIT - I

1 a. Define operating system. Explain the different services provided by the operating system. **08 M**

(Level [1,2], CO [1], PO [1])

b. Explain the advantages of multiprocessor systems. **06 M**

(Level [2], CO [1], PO [1])

c. List the activities of operating system in connection with process management and memory management. **06 M**

(Level [1], CO [1], PO [1])

UNIT – II

2 a. Explain the Process state transition diagram. **06 M**

(Level [2], CO [2], PO [1])

b. Compute average waiting time and average turnaround time for the given processes using SRTF and Round Robin scheduling algorithm with a time quantum =4 ms. **08 M**

Process	Arrival time	CPU burst time(ms)
P1	0	8
P2	1	4
P3	2	9
P4	3	5

(Level [3], CO [2], PO [1,4])

c. Explain the Multithreading models. **06 M**

(Level [2], CO [2], PO [1])

OR

3 a. What is a critical section problem? Explain the Peterson's solution. **10 M**

(Level [2], CO [3], PO [1])

b. Define Semaphores along with its usage. How it is used to solve classical dining Philosopher's problem. **10 M**

(Level [2], CO [3], PO [1])

UNIT – III

4 a. List and explain the necessary conditions that causes deadlock to occur in a system. **06 M**

(Level [1,2], CO [2], PO [1])

b. Explain the methods available to prevent a deadlock. **06 M**

(Level [2], CO [2], PO [2])

c. Consider the system with Five processes (P0 to P4) and Three resource types A,B,C(10,5,7) instances. 08 M

	Allocation	Max	Available
P0	0 1 0	7 5 3	3 3 2
P1	2 0 0	3 2 2	
P2	3 0 2	9 0 2	
P3	2 1 1	2 2 2	
P4	0 0 2		

Check whether a system is in safe state and find the safe sequence of processes.

(Level [4], CO [2], PO [ ])

UNIT – IV

5 a. Define page fault. Illustrate, with a neat diagram the steps in handling a page faults. 10 M

(Level [2], CO [3], PO [1, 2])

b. For the following reference string, determine the page faults that occur using FIFO and LRU page replacement algorithms for 3 and 4 page frames. 10 M
Reference string: 5, 4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5

(Level [5], CO [4], PO [1,4])

OR

6 a. Explain the hardware support for segmentation, with a neat diagram. 06 M

(Level [2], CO [4], PO [1])

b. For the following reference string, determine the page-faults that occur using LRU and Optimal page replacement algorithms for 3 and 4 page frames. 10 M
Reference string: 7, 0, 1, 2, 0, 3, 0, 4 , 2, 3, 0, 3, 2, 1, 2, 0, 1, 7, 0, 1

(Level [5], CO [4], PO [1, 4])

c. Explain thrashing and the causes of its occurrence. 04 M

(Level [2], CO [4], PO [1])

UNIT – V

7 a. List and explain the attributes of file. 06 M

(Level [1,2], CO [3], PO [12])

b. Explain the following file Access methods 08 M
a) Sequential access b) Direct access

(Level [2], CO [3], PO [1])

c. Explain common file types. 06 M

(Level [2], CO [3], PO [12])

OR

8 a. Explain the following 10 M
a) File system mounting b) File protection

(Level [1], CO [3], PO [1])

b. With a dingram explain the schematic view of virtual file system 10 M

(Level [2], CO [3], PO [1])

USN : _____ Course Code : 18CS43

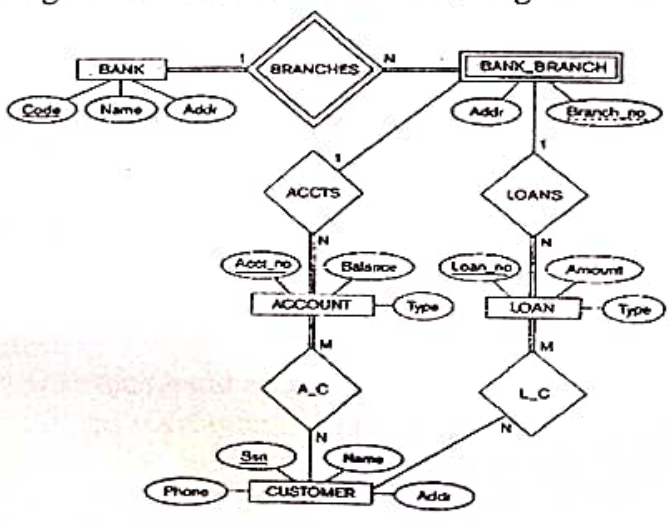
Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021

DATABASE MANAGEMENT SYSTEM

Time: 3 hrs Max. Marks :100

Instructions : Answer any Five full Questions. 2 All units carry equal marks.

	L	CO	PO	M
1a. Discuss the main characteristics of the database approach and how it differs from traditional file systems.	[2]	[1]	[1]	[10]
1b. Identfy the entities, attributes, relationships and cardinality ratios for the following and then sketch an Entity-Relationship diagram based on the following business rules: 1.A salesperson may manage many other salespeople. 2.A salesperson is managed by only one salespeople. 3.A salesperson can be an agent for many customers. 4.A customer is managed by one salespeople. 5.A customer can place many orders. 6.An order can be placed by one customer. 7.An order lists many inventory items. 8.An inventory item may be listed on many orders. 9.An inventory item is assembled from many parts. 10.A part may be assembled into many inventory items. 11.Many employees assemble an inventory item from many parts. 12.A supplier supplies many parts. 13.A part may be supplied by many suppliers.	[3]	[2]	[3]	[10]
2a. Explain the three-schema architecture. Why do we need mappings between schema levels?	[2]	[1]	[1]	[10]
2b. Analyze a hospital management system and sketch an Entity-Relationship diagram by : 1) Identifying the various entities and their attributes, 2) Specifying the key attributes of each entity type, 3) Identifying the various relationships between the entities and 4) The structural constraints on each relationship type. Make appropriate assumptions and state the same.	[4]	[2]	[3]	[10]
3a. With an example explain the different types of join operations in Relational Algebra.	[2]	[1]	[1]	[10]
3b. Consider the ER diagram given below. Apply the ER-to-Relational mapping algorithm to map the following ER-diagram into a relational database design.	[3]	[2]	[3]	[5]

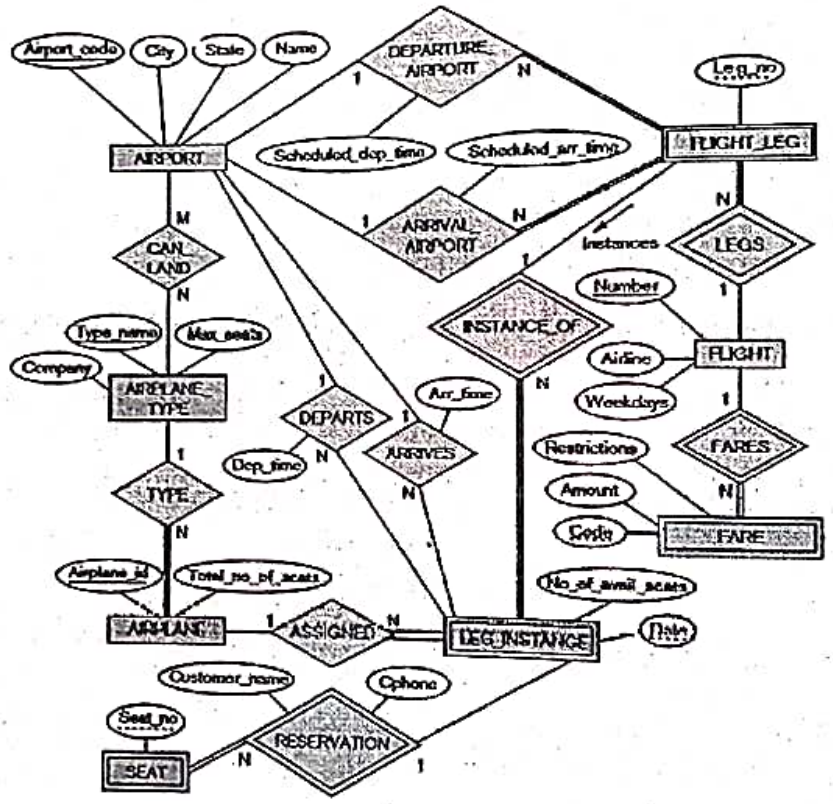


3c. Consider the following schema for a library database:
Author (authorname, citizenship, birthyear)
Book(isbn, title, authorname)
Topic(isbn, subject)
Branch(libname, city)
Instock(isbn, libname, quantity)
Solve for the following queries by writing relational algebra expressions:

1.Give all authors born after 1940.
2.Give the names of libraries in Sydney.
3.Give the title of each book on the topic of either alcohol or drugs.
4.Give the title and author of each book of which at least two copies are held in a branch located in Melbourne.
5.Give the name of each Italian author who wrote an autobiography.

[3] [1] [3] [5]

4a. Consider the ER diagram for an AIRLINE database schema given below. Apply the ER-to-Relational mapping algorithm to map the following ER-diagram into a relational database design.



4b. How is an inner join different from an outer join? [3] [2] [3] [10]

Consider the PRICES and QUANTITIES tables and show the output of the following:

1.PRICES ⋈ QUANTITIES
2.PRICES ⋈Prices.product = Quantities.product QUANTITIES
3.PRICES ⋈ Prices.product = Quantities.product QUANTITIES
4.PRICES ⋈Prices.product = Quantities.productQUANTITIES

TABLE 1: PRICES

PRODUCT	PRICE
Potatoes	$3
Avocados	$4
Kiwis	$2
Onions	$1
Melons	$5
Oranges	$5
Tomatoes	$6

TABLE 2: QUANTITIES

PRODUCT	QUANTITY
Potatoes	45
Avocados	63
Kiwis	19
Onions	20
Melons	66
Broccoli	27
Squash	92

[2] [1] [3] [5]

4c. Explain the following with an example for each:
1) Domain Constraint 2) Super key 3) Candidate key 4) Entity integrity constraint 5) Referential Integrity constraint

[2] [1] [1] [5]

5a. Consider the following relation schema:
CAR_SALE(Car#,Date_sold,Salesperson#,Commission%,Discount_amt)
Assume that a car may be sold by multiple salespeople, and hence {Car#,Salesperson#} is the primary key.
Additional dependencies are:
Date_sold→Discount_amt and
Salesperson# →Commission%.
Based on the given primary key, is this relation in 1NF, 2NF, or 3NF? Why orwhy not? How would you successively normalize it completely? Apply normalization until you cannot decompose the relations further. State the reasons behind each decomposition.

[3] [3] [2] [10]

5b. Discuss the ACID properties of a database transaction.

[2] [5] [1] [5]

5c. Draw a state diagram and discuss the typical states that a transaction goesthrough during execution.

[2] [5] [1] [5]

6a. What is normalization and why is it needed ? Explain the 1NF, 2NF and 3NF with an example for each.

[3] [3] [2] [10]

6b. What is a lock? Explain the different types of locks used in concurrency control?

[2] [5] [1] [5]

6c. What is the two-phase locking protocol? How does it guarantee serializability?

[2] [5] [1] [5]

7a. Explain the various DML commands used in SQL along with their syntax.

[2] [4] [1] [10]

7b. Assume the following relational database: STUDENT (USN, NAME, SEM, DNO)
DEPARTMENT (DNO, DNAME, DLOC)
COURSE (COURSE#, CNAME, CREDIT, TYPE)
ENROLL (USN, COURSE#, SCORE)
1) Write appropriate SQL DDL statements to define the database.
2) Infer SQL queries for the following:

a.List all students who are studying in 'Mechanical Engineering Department' and are in 4th semester.

b.List names of all students who are in 5th semester and have opted for elective courses and belong to 'CSE' department

c.List the Department wise total number of students.

d.List the department that has maximum number of students.

List total number of students who are in 2nd semester and have scored above 15 in 'Maths' subject.

[4] [4] [3] [10]

8a. List and explain the various constraints used in SQL with an example for each [2] [4] [1] [10]

8b. Consider the CUSTOMERS table having the following records:

ID	NAME	AGE	ADDRESS	SALARY
1	Ramesh	35	Ahmedabad	2000.00
2	Khilan	25	Delhi	1500.00
3	kaushik	23	Kota	2000.00
4	Chaitali	25	Mumbai	6500.00
5	Hardik	27	Bhopal	8500.00
6	Komal	22	MP	4500.00
7	Muffy	24	Indore	10000.00

Solve by inferring the output of the following SQL queries? Illustrate the output in the table/other form as applicable.

i) SELECT * FROM CUSTOMERS WHERE ID IN (SELECT ID FROM CUSTOMERS WHERE
SALARY >4500);

ii) UPDATE CUSTOMERS SET SALARY = SALARY * 0.25 WHERE AGE IN (SELECT AGE FROM CUSTOMERS WHERE AGE >= 27);

iii) SELECT AGE FROM CUSTOMERS GROUP BY age HAVING COUNT(age) >= 2;

iv) SELECT NAME, Max(Salary)AS MAX_SALARY ,Min(Salary) AS MIN_SALARY ,Avg(Salary)AS AVG_SALARY FROM CUSTOMERS;

v)DELETE FROM CUSTOMERS WHERE AGE IN (SELECT AGE FROM CUSTOMERS WHERE AGE>=27);

[4] [4] [3] [5]

8c. Explain with syntax how the ALTER TABLE statement can be used to add, delete, or modify columns in an existing table and to add, drop various constraints on an existing table.

[2] [4] [1] [5]

9a. Differentiate between a PL/SQL function and a procedure? Explain with syntax how a standalone function can be created in PL/SQL. Develop a PL/SQL function that computes and returns the maximum of two values.

[2] [4] [1] [10]

9b. When would you use a PL/SQL loop? With syntax and an example , explain the PL/SQL FOR and WHILE loops

[2] [4] [1] [5]

9c. Define a cursor. Compare implicit and explicit cursors.

[2] [4] [1] [5]

10a. What is the difference between a function and procedure in PL/SQL? Explain with syntax how a procedure can be created in PL/SQL. Develop a PL/SQL procedure takes two numbers using IN mode and returns their minimum using OUT parameters.

[2] [4] [1] [10]

10b. What are the components of PL/SQL block structure? Explain with syntax and an example

[2] [4] [1] [5]

10c. Define a trigger. Explain the syntax for creating a trigger.

[2] [4] [1] [5]

USN : _____ Course Code : 16IS45

Fourth Semester B.E FASTTRACK Examination, AUGUST_SEPTEMBER_2021

DATABASE MANAGEMENT SYSTEM

Time: 3 hrs Max. Marks :100

Instructions : 1.Assume suitable data if any. 2.Answer should be completely written.3. Answer any Five full Questions.

	L	CO	PO	M
1a. Define the terms Database, DBMS and Data .List and briefly explain any five characteristics of DBMS.	[1]	[1]	[1]	[10]
1b. Suppose that you are a database designer and you have been approached to design a database for Library Management website. Make appropriate assumptions and state the following. 1) Identify minimum 4 entities and their attributes, 2) List the attributes and specify the key attributes of each entity type, 3) Identify the various relationships between the entities, 4) The structural constraints on each relationship type 5) Analyze the given scenario and model the same conceptually using an E-RDiagram.	[4]	[3]	[4]	[10]
2a. A college database contains information about professors, students, courses and classes.Describe the most suitable and appropriate assumptions madeby you in understanding constraints. Identify attributes for each of the entities, keys and relations between them. Justify cardinality and participation constraints for the same with examples. Propose a neat ER diagram for the same.	[4]	[3]	[4]	[10]
2b. Explain three schema architecture with neat digram.	[2]	[1]	[1]	[5]
2c. Illustrate different types of attributes with suitable examples.	[2]	[1]	[1]	[5]
3a. Explain various Unary Relational operations in relational algebra with an example.	[2]	[2]	[2]	[10]
3b. Demonstrate different types joins in relational algebra with examples.	[2]	[2]	[2]	[10]
4a. Given the schema EMP (Fname, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN, Dno) DEPT(Dname, Dnumber, MgrSSN, MGrstartdate) DEPT-LOC (Dnumber, Dloc) PROJECT(Pname, Pnumber, Ploc,Dnum) WORKS-ON (ESSN,PNo,Hours) Give the relation algebra expression for the following: 1.List the Birth Dates of all employees 2.List all female Employees of the Department 3.List the Dept details by name "Computer Science" 4.List details of Project where Pnumber=50 5. List the locations of all the departments	[3]	[2]	[3]	[10]
4b. Demonstrate with suitable examples (i) UNION (ii) INTERSECTION and (iii) MINUS	[2]	[2]	[4]	[10]

5a. Explain 1NF, 2NF and 3NF with an example. [2] [3] [4] [10]

5b. What is BCNF? How it is different from 3NF? Illustrate with an example. [2] [3] [3] [10]

6a. Explain the causes of transaction failure and List the ACID properties. [2] [4] [1] [10]

6b. Explain the following in relation with concurrency control with an example:
i) The Lost update problem
ii) The temporary update problem. [2] [4] [2] [10]

7a. Explain the different Aggregate functions used in SQL, with examples. [2] [2] [4] [10]

7b. Consider the following database of student enrollment in courses & books adopted for each course.
STUDENT (regno: string, name: string, major: string, bdate:date)
COURSE (course:int, cname:string, dept:string)
ENROLL (regno:string, course:int, sem:int, marks:int)
BOOK _ ADOPTION (course:int, sem:int, book-ISBN:int)
TEXT (book-ISBN:int, book-title:string, publisher:string, author:string)

1.Write SQL query to create tables STUDENT and ENROLL
2.Write SQL query to add a record to COURSE table
3.Write SQL query to delete a record from BOOK _ ADOPTION table
4.Write SQL query to search for a record in TEXT table where publisher name is "Penguin"

[3] [2] [2] [10]

8a. Write the following SQL Queries for the Library Management system specified in Qno 1b:

1.List the Tables required for Library Managenent System with Schema diagrams
2.Write a SQL queries to create the tables for one of the entities identified
3.Write a SQL query to delete the specific rows from a specific table
4.Write a SQL query to insert data into a specific table
5.Write a SQL query to update data into a specific table

[3] [2] [2] [10]

8b. Demonstrate DROP, ALTER, UPDATE, commands with an example for each. [2] [2] [2] [10]

9a. HowPL/SQL Block Structure is organized. Also explain PL/SQL variables declarations. [2] [2] [4] [10]

9b. Explain PL/SQL looping statements with examples. [2] [2] [4] [10]

10a. Illustrate with suitable examples (i) PL/SQL function (ii) PL/SQL procedure. [2] [2] [4] [10]

10b. Explain various types of loops available in PL/SQL. Illustrate the syntax with suitable examples

[2] [2] [4] [10]

USN : _____ Course Code : 18CS43

Fourth Semester B.E Makeup Examination, SEPT._OCT._2020

DATABASE MANAGEMENT SYSTEM

Time: 3 hrs Max.Marks :100

Instructions :1. Answer any Five full Questions selecting at least One Full Question from Each Unit. 2. Each Question carry Equal Marks. 3. Missing Data may be suitably assumed. 4. Draw Figures wherever necessary.

MODULE 1 **L CO PO M**

1a. List the advantages of using DBMS approach and explain(any 3) in brief.

[2] [1] [1] [8]

1b. Suppose that you are a database designer and you have been approached to design a database for BANK. Analyze the given scenario and model the same conceptually using an E-R diagram. Make appropriate assumptions and state the same.

1) Identify the various entities and their attributes,
2) Specify the key attributes of each entity type,
3) Identify the various relationships between the entities,
4) The structural constraints on each relationship type.

[4] [1] [3] [12]

OR

2a. Explain the different types of notations used in ER representation with an example for each.

[2] [1] [1] [8]

2b. Suppose that you are a database designer and you have been approached to design a database for HOSPITAL Management. Analyze the given scenario and model the same conceptually using an E-R diagram. Make appropriate assumptions and state the same.

1) Identify the various entities and their attributes,
2) Specify the key attributes of each entity type,
3) Identify the various relationships between the entities,
4) The structural constraints on each relationship type.

[4] [1] [3] [12]

MODULE 2

3a. Explain the different types of JOIN operations in relational algebra with an example.

[2] [1] [1] [10]

3b. Consider the following company database

Employee(Ssn, Fname, Lname, Bdate, Addr, Dno)
Department(Dno, Dname, Mgrssn)
Department_Location(Dno, Dloc)
Project(Pno, Pname, Ploc, Dno)
Works_On(Ssn, Pno, Hours)

Write the following queries in relational algebra on the database schema:

1.Retrieve the name and address of all employees who work for the "Research" department.
2. Retrieve the department names that are located in "Delhi".
3. For every project located in "MUMBAI", list the project number, controlling department number, department manager's last name, address and birthdate.
4. Find the department name who works on the project named "Make in India".
5. Find the names of employees who work on all projects controlled by department number 5

[3] [1] [4] [10]

OR

4a. Demonstrate the various types of operations from set theory used in relational algebra with an example [3] [1] [2] [10]

4b. Explain the DIVISION operation. Find the quotient for the following:

1.A / B1
2.A / B2
3.A / B3
4.A / B4
5.A / B5,

where A, B1, B2, B3, B4 and B5 are as follows:

SNO	PNO
S1	P1
S1	P2
S1	P3
S1	P4
S2	P1
S2	P2
S3	P2
S4	P2
S4	P4

PNO
P2

PNO
P2
P3

PNO
P2
P4

PNO
P2
P3
P4

PNO
P1
P2
P4

MODULE 3 [3] [1] [4] [10]

5a. List the Informal Design Guidelines for relational schemas. [1] [2] [1] [4]

5b. Define normalization. State the following with an example for each.
1) First Normal Form2) Second Normal Form3) Third Normal Form. [2] [2] [2] [8]

5c. Is the following relation in 1 NF? If not, apply the various ways for converting the same into 1 NF.

USN	NAME	GENDER	CITY	HOBBIES

[3] [2] [2] [8]

OR

6a. Explain the various reasons for transaction failure.

[2] [4] [1] [6]

6b. What are ACID properties? Explain in detail.

[2] [4] [1] [8]

6c. What is Lost Update problem in transactions? Demonstrate the same with an example.

[3] [4] [2] [6]

MODULE 4

7a. What are DDL and DML in SQL? Explain the various DDL & DML commands with an example.

[2] [3] [1] [10]

7b. Consider the following Schema :
STUDENT(Sno,Sname,Branch,Level, Age)
CLASS(Cname, Meetat, Room, Fid)
ENROLLED(Snum, Cname)
FACULTY(Fid, Fname, Salary)
Write SQL queries for the following:

1.Find the names of all juniors (level = JR) who are enrolled in a class taught by Prof. John.

2.Find the names of all classes that either meet in room R128 or have four or more Students enrolled.

3.Find the subject names that meet at the same time in the same room.

4.Find the subject names and the total count for each subject that students have enrolled for(display which subject has more students first)?

[3] [3] [3] [10]

OR

8a. List and explain the various aggregate functions in SQL with an example for each.

[2] [3] [1] [8]

8b. Consider the following Schema:

FLIGHTS(Fno, Fromplace, Toplace, Distance, Arrives, Price)
AIRCRAFTS(Aid,Aname, Cruisingrange)
CERTIFIED(Eid, Aid)
EMPLOYEE(Eid, Ename, Salary)
Write SQl queries for the following:

1.Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.

2.For each pilot who is certified for more than three aircrafts,Find theeid and the maximum range of the aircraft for which she or he is certified.

3.Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.

4.Find the names of pilots certified for some aircraft whose names starts with 'A' and ends with 'A'.

5.Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi. [3]
6.Count the totally numbers of pilots and aircraft id, certified to fly different aircrafts. [3] [4] [12]

MODULE 5

9a. With a neat diagram, explain the PL / SQL block structure. [2] [3] [1] [7]

9b. Explain with syntax, the various loop statements used in PL / SQL. [2] [3] [1] [6]

9c. Write PL / SQL code to find factorial of a number. [3] [3] [3] [7]

OR

10a. What are PL / SQL variables? Give the syntax for declaring the variables. Also list the guidelines for declaring variables. [2] [3] [2] [6]

10b. Write PL / SQL Code to swap two numbers. [3] [3] [3] [7]

10c. Write PL / SQL code to reverse a given number. [3] [3] [3] [7]

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16CS/IS45

Fourth Semester B.E. Semester End Examination, May/June 2018-19

DATABASE MANAGEMENT SYSTEM

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *Unit III & V are compulsory.*
2. *Attempt any one full question from remaining units.*

UNIT – I

			L	CO	PO	M
1	a.	What is DBMS? Explain the various characteristics of the Database Approach.	(2)	(1)	(2)	(07)
	b.	Identify and explain the roles of various actors on the scene in Database approach.	(2)	(1)	(2)	(06)
	c.	With a neat block diagram, explain the Three-schema architecture in DBMS.	(2)	(1)	(2)	(07)

OR

2 a Suppose that you are a database designer and you have been approached to design a database for **COLLEGE**. Analyze the given scenario and model the same conceptually using an E-R diagram. Make appropriate assumptions and state the same.
1) Identify the various entities and their attributes,
2) Specify the key attributes of each entity type,
3) Identify the various relationships between the entities,
4) The structural constraints on each relationship type

(3) (2) (4) (12)

b. Explain the different types of attributes with an example for each.

(2) (2) (2) (08)

UNIT – II

			L	CO	PO	M
3	a.	Compute the resultant tables of the following set operations applied on tables in Fig.1.				

(i) STUDENT U INSTRUCTOR (union)
(ii) STUDENT ∩ INSTRUCTOR (intersection)
(iii)STUDENT – INSTRUCTOR (minus)
(iv)INSTRUCTOR – STUDENT (minus)
(v)

STUDENT

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

INSTRUCTOR

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Yao
Francis	Johnson
Ramesh	Shah

Fig.1.

(3) (4) (2) (08)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

b. **Given the schema**
EMP (Fname, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN, Dno)
DEPT(Dname, Dnumber, MgrSSN, MGrstartdate)
DEPT-LOC (Dnumber, Dloc)
PROJECT(Pname, Pnumber, Ploc,Dnum)
WORKS-ON (ESSN,PNo,Hours)

Write the relational algebra for the following queries.
List the Fname, Lname of all the employees who work for Dname='Research'
Retrieve the SSN of all the MALE employees who is also a manager.
Retrieve all female Employees of who work on Project="Construction"
List fname,lname,address,salary details of all managers

(3) (4) (3) (1

OR

4 a. Explain the following with suitable examples. (i) Key Constraints (ii) Participation constraint (i
Weak entity (iv) Recursive Relationship

(2) (2) (02) (0

b. Consider the two tables *T*1 and *T*2 shown in Fig. 2. Find the results of the following operations:
(i) T1 X T2
(ii) $T1 \bowtie T1.P = T2.A$ *T2*
(iii) $T1 \bowtie T1.Q = T2.B$ *T2*
(iv) $T1 \bowtie (T1.P = T2.A$ **AND** $T1.R = T2.C)$ *T2*

TABLE T1

P	Q	R
10	a	5
15	b	8
25	a	6

TABLE T2

A	B	C
10	b	6
25	c	3
10	b	5

Fig. 2

(3) (4) (2)
L CO PO

UNIT – III(Compulsory)

5 a. Explain the following with an example for each.
1) First NF 2) Second NF 3)Third NF 4) BCNF

(2) (3) (2)

b. Explain the various reasons that cause a transaction to fail in the middle of execution.

(2) (5) (2)
L CO PO

UNIT – IV

6 a. Explain the various schema change statements in SQL with an example for each.

(2) (4) (2)

b. List and explain the various aggregate functions available in SQL.

(2) (4) (2)

c. **Consider the following table (STAFF)**

FID	Fname	City	Dept	Salary
1	Dilip	Belgaum	CSE	5000
2	Samit	Mumbai	CSE	4000
3	Abhishek	Pune	EC	5000
4	Deepa	Belgaum	EC	10000
5	Sahil	Dharwad	MECH	9000
6	Mohit	Belgaum	CSE	12000

Write the SQL queries for the following statements along with the sample output.

a. List all the faculties whose salary is more than 10000;
b. Update the salary of all the employees to 30000 who belongs to department of CSE.
c. Display all the details of the employee whose name's second alphabet is 'b' and fourth alphabet is 'i' and name should end with 'k' alphabet.
d. Display the employee details in the order of their decreasing salary.
e. Display the details of the employee who stays in 'Belgaum' and salary should be in the range of 5000 to 10000.

(5) (4) (4) (05)

OR

7 a. Draw the Schema diagram and Write the SQL queries for the following Database Schema
FLIGHTS(no: integer, fromPlace: string, toPlace: string, distance: integer, Departs: date, arrives: date, price: real)
AIRCRAFT(aid: integer, aname: string, cruisingrange: integer)
CERTIFIED(eid: integer, **aid**: integer)
EMPLOYEES(eid: integer, ename: string, salary: integer)

1) Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.
2) Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.
3) Find the names of pilots certified for some Boeing aircraft.
4) Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi.

(5) (4) (4) (10)

b. Define the following with an example for each
1) Primary key 2) Composite key 3) Foreign key 4) NULL Constraint 5) Weak Entity

(1) (4) (2) (05)

c. Explain the various DML commands in SQL.

(2) (4) (2) (05)

UNIT -V(Compulsory)

L CO PO M

8 a. With a neat diagram, explain the PL/SQL Block structure. Also explain PL/SQL variables.

(2) (4) (2) (10)

b. Explain the various looping constructs in PL/SQL.

(2) (4) (2) (10)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

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16CS / IS45

Fourth Semester B.E. Makeup Examination, May/June 2018-19

DATABASE MANAGEMENT SYSTEM

Time: 3 Hours | Max. Marks: 100

Instructions:
1. *UNIT III and UNIT V are compulsory*
2. *Answer one complete question from the remaining units.*
3. *Make suitable assumptions if required.*

UNIT - I

		L	CO	PO	M
a.	List and explain in brief, any five advantages of using the DBMS approach. And explain the responsibilities of actors on the scene for database system environment.	(2)	(1)	(02)	(10)
b.	Suppose that you are a database designer and you have been approached to design a database for Bank system. Make appropriate assumptions to:. 1) Identify minimum four entities and their attributes, 2) List the attributes and specify the key attributes of each entity type, 3) Identify the various relationships between the entities, 4) The structural constraints on each relationship type 5) Analyze the given scenario and model the same conceptually using an E-R Diagram.	(3)	(1)	(2,3)	(10)

OR

a.	Explain the three schema architecture of DBMS using neat diagram.	(2)	(1)	(10)	(05)
b.	A university database contains information about professors, courses, classes, department and books. Identify suitable relations. Justify cardinality and participation constraints for the same with examples. Sketch a neat ER diagram.	(4)	(2)	(2,3)	(10)
c.	Explain the responsibilities of actors behind the scene for database system environment.	(2)	(1)	(2)	(05)

UNIT – II

		L	CO	PO	M
a.	Consider the following relational schema. Emp(eid,ename, age, salary) Works_for(eid, pid, Hours) Project(pid, pname) Write the queries in relational algebra for the following: 1) Retrieve employee id and name of the employee who works for all the projects. 2) Retrieve name and age of employees whose salary > 10000. 3) For each employee, get the number of projects and number of hours worked on projects. 4) Retrieve names of employees working on 'CSE' project. 5) Retrieve name and age of the employees who works on project for more than 3 hours.	(5)	(2)	(3)	(10)
b.	Explain the various Relational Algebra Operations from Set Theory with an example for each.	(2)	(2)	(2)	(10)

OR

a.	Explain SELECT, PROJECT and OPERATIONS from Set Theory in relational algebra with example.	(2)	(2)	(2)	(10)
b.	Explain the following with an example for each. 1) Inner join 2) Left join 3) Full join	(2)	(2)	(2)	(10)

UNIT – III (Compulsory)

			L	CO	PO	
5	a.	Explain 1NF, 2NF,3NF and BCNF with suitable examples.	(2)	(3)	(02)	
	b.	Define Transaction. Explain with example (i) The Lost Update Problem (ii)Incorrect Summary Problem	(2)	(4)	(02)	

UNIT - IV

			L	CO	PO	
6	a.	**Given the schema** CAR(Serial_no, Model, Manufacturer, Price) OPTION(Serial_no, Option_name, Price) SALE(Salesperson_id, Serial_no, Date, Sale_price) SALESPERSON(Salesperson_id, Name, Phone) Identify SQL statements for following: (i) Find the list of car manufacturers and models who are quoting price less than Rs: 8,50,000/- (ii) Retrieve the names and phone of salesperson who have sale price greater than Rs:50,000/- (iii) List all the option names available for car model = "AUDI (iv) List the names and phone numbers of salesperson for manufacturer="FORD ICON"	(4)	(2)	(3)	
	b.	Demonstrate DROP, ALTER, UPDATE, commands with an example for each.	(3)	(2)	(3,10)	

OR

7	a.	Consider the following database of student enrolment in courses & books adopted for each course. STUDENT (regno: string, name: string, major: string, bdate:date) COURSE (course:int, cname:string, dept:string) ENROLL (regno:string, course:int, sem:int, marks:int) BOOK _ ADOPTION (course:int, sem:int, book-ISBN:int) TEXT (book-ISBN:int, book-title:string, publisher:string, author:string) Write SQL queries : i. to create all the tables ii. to add a record to STUDENT and COURSE table iii. to delete a record from BOOK _ ADOPTION table iv. to search for a record in TEXT table where publisher name is "Penguin"	(3)	(4)	(2)	
	b.	Explain the different Aggregate functions used in SQL, with examples.	(2)	(2)	(10)	

UNIT –V (Compulsory)

			L	CO	PO	
8	a.	Discuss the basic structure of a PL/SQL block with its components with a suitable example.	(2)	(2)	(10)	
	b.	Illustrate the syntax with suitable examples (i) PL/SQL function (ii) PL/SQL procedure.	(2)	(2)	(10)	
	c.	Illustrate the PL/SQL statements with syntax and suitable examples (i) if-else (ii) case.	(2)	(2)	(10)	

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CS/IS46/16CS/IS45

Fourth Semester B.E. Semester End Examination, May/June 2018

DATABASE MANAGEMENT SYSTEM

Time: 3 Hours Max. Marks: 100

Instructions: 1. *Unit – I and Unit – V are compulsory.*
2. *Answer any one full question from remaining Units.*

UNIT - I

1. a. Explain the three schema architecture with a neat diagram. Why do we need mappings between schema levels? **08 M**

(Level[2], CO[1], PO[3])

b. Suppose that you are a database designer and you have been approached to design a database for BANK. Analyze the given scenario and model the same conceptually using an E-R diagram. Make appropriate assumptions and state the same. **12 M**

1) Identify the various entities and their attributes,

2) Specify the key attributes of each entity type,

3) Identify the various relationships between the entities,

4) The structural constraints on each relationship type

(Level[3], CO[1], PO3])

UNIT - II

2 a. Explain the following with suitable examples **08 M**
(i) Domain constraint (ii) Key constraint (iii) Entity Integrity constraint (iv) Referential Integrity constraint.

(Level [2], CO [2], PO [10])

b. Find the resultant tables of the following set operations applied on tables in Fig.1. **12 M**

(i) STUDENT U INSTRUCTOR (union)
(ii) STUDENT ∩ INSTRUCTOR (intersection)
(iii)STUDENT - INSTRUCTOR (minus)
(iv)INSTRUCTOR - STUDENT

STUDENT

Fn	Ln
Susan	Yao
Ramesh	Shah
Johnny	Kohler
Barbara	Jones
Amy	Ford
Jimmy	Wang
Ernest	Gilbert

INSTRUCTOR

Fname	Lname
John	Smith
Ricardo	Browne
Susan	Yao
Francis	Johnson
Ramesh	Shah

Fig. 1. STUDENT table and INSTRUCTOR table

(Level [3], CO [2], PO [1])

OR

3 a. Consider the two tables T1 and T2 shown in Figure 2. Find the results of the following operations:

(i) T1 X T2
(ii) $T1 \bowtie_{T1.P = T2.A} T2$
(iii) $T1 \bowtie_{T1.Q = T2.B} T2$
(iv) $T1 \bowtie_{(T1.P = T2.A \text{ AND } T1.R = T2.C)} T2$

TABLE T1

P	Q	R
10	a	5
15	b	8
25	a	6

TABLE T2

A	B	C
10	b	6
25	c	3
10	b	5

Fig. 2. A database state for the relations T1 and T 2.

(Level [3], CO [2], PO [2])

b. **Given the schema**
EMP (Fname, Lname, SSN, Bdate, Address, Sex, Salary, SuperSSN, Dno)
DEPT(Dname, Dnumber, MgrSSN, MGrstartdate)
DEPT-LOC (Dnumber, Dloc)
PROJECT(Pname, Pnumber, Ploc,Dnum)
WORKS-ON (ESSN,PNo,Hours)

Write the relational algebra for the following queries.

(i) List the Fname, Lname of all the employees who work for Dname='Research'
(ii) List the SSN of all the MALE employees
(iii) List the all Project names at Ploc = 'Bombay' and controlled by 'Research' department.
(iv) List the Fname and Salary of the employees who work for more than 12 hours.

(Level [3], CO [2], PO [1,5])

UNIT – III

4 a. Briefly explain the various reasons for a transaction to fail with an example. 08

b. Explain ACID properties of transactions (Level[2], CO[4], PO[2]) 04

c. What is BCNF? How it is different from 3NF? Prove that a relation with two attributes is always in BCNF. (Level[2], CO[4], PO[2]) 08

OR (Level[3], CO[3], PO[4])

5 a. Explain three different techniques to achieve 1NF using a suitable example. 10

b. List a few Database applications where transaction processing is used and also explain the two-phase locking techniques for concurrency control. (Level[3], CO[3], PO[3]) 10

(Level[2], CO[4], PO[2])

UNIT - IV

6 a. Given the schema 12 M

CAR(Serial_no, Model, Manufacturer, Price)

OPTION(Serial_no, Option_name, Price)

SALE(Salesperson_id, Serial_no, Date, Sale_price)

SALESPERSON(Salesperson_id, Name, Phone)

Write the SQL statements for following:

(i) Find the list of car manufacturers and models who are quoting price greater than Rs: 3,50,000/-
(ii) Find the names of salesperson who have sale price less than Rs:10,000/-
(iii) List all the option names available for car model = "FORD ICON"
(iv) List the names and phone numbers of salesperson for manufacturer="AUDI".

(Level [3], CO [2], PO [2,3])

b. Explain following data types available for attributes in SQL. 08 M

(i) numeric (ii) character string (iii) date

(Level [2], CO [2], PO [10])

OR

7 a. Write SQL statements to do the following on the database schema shown in Figure 3. 12 M

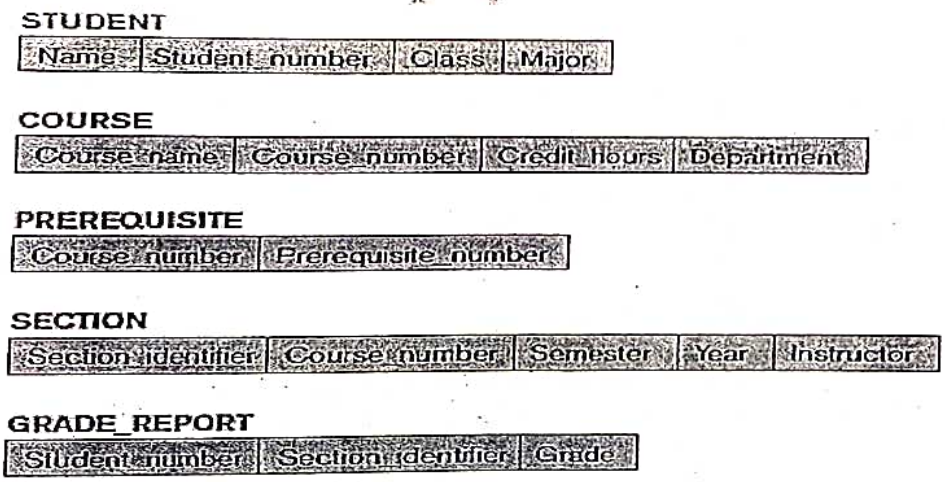

Fig.3. Student Schema

i) Create all the tables in Fig.2.
ii) Insert a new student, <'Johnson', 25, 1,'Math'>, in the database.
iii) Insert a new course, <'Knowledge engineering', 'CS4390', 3, 'CS'>.
iv) Delete the record for the student whose name is 'Smith' and whose number is 17.

(Level [3], CO [2], PO [3])

b. Demonstrate DROP, ALTER, UPDATE, commands with an example for each. 08 M

(Level [3], CO [2], PO [10])

UNIT – V

8 a. What is the purpose of the PL / SQL languages? State notable characteristics of PL / SQL. (Level [2], CO [2] , PO [3]) 04

b. Explain the PL / SQL Block structure along with variables. (Level[2], CO[2], PO[2]) 08

c. Explain PL/SQL while and for loop statements with an example. (Level[2], CO[2], PO[2, 3]) 08

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16CS / IS45

Fourth Semester B.E. Makeup Examination, June 2018

DATABASE MANAGEMENT SYSTEM

Time: 3 Hours

Max. Marks: 100

Instructions:
1. *UNIT I and UNIT V are compulsory*
2. *Answer one complete question from the remaining units.*
3. *Make suitable assumptions if required.*

UNIT - I

1 a. Explain the responsibilities of actors on the scene for database system environment. **05 M**
(Level [2], CO [1], PO [10])

b. Explain in brief , any 5 advantages of using the DBMS approach **05 M**
(Level [2], CO [1], PO [10])

c. A university database contains information about professors, students, courses and classes. Identify attributes for each of the entities and relations between them. Justify cardinality and participation constraints for the same with examples. Propose a neat ER diagram for the same. **10 M**
(Level [3,4], CO [1], PO [2,5])

UNIT – II

2 a. Explain the various Relational Algebra Operations from Set Theory with examples. **06 M**
(Level[2], CO[2], PO[2, 3])

b. Explain SELECT and PROJECT operations in Relational Algebra with an example. **06 M**
(Level[2], CO[2], PO[3,4])

c. Given the schema : **08 M**
Student (USN, NAME, BRANCH, PERCENTAGE)
Faculty (FID, FNAME, DEPT, DESIGNATION, SALARY)
Course (CID, CNAME, FID)
Enroll (CID, USN, GRADE)
Give the relation algebra expression for the following :
i) Retrieve the name and percentage of all students for the course 16CS45.
ii) List the Departments having a average salary of the faculties above Rs 30,000.
iii) List name of the course having students grade 'A' maximum
(Level[4], CO[2], PO[3 , 4])

OR

3 a. Explain different types of JOIN operations in relational algebra with an example. **06 M**
(Level[2], CO[2], PO[2])

b. Explain Insert, Delete and Update operations in relational algebra with an example. **06 M**
(Level[2], CO[2], PO[3])

c. Consider the following Relations for a database that keeps track of auto sales in a car dealership. **08 M**
CAR(serial no , Model , Manufacturer , Price)
OPTION(serial no , option name , price)
SALE(salesperson_ id , serial_no , Date , sale_ price)
SALESPERSON(salesperson id , Name , phone)
a) Specify the foreign keys for the above schema
b) Populate the relations with a few example tuples
c) Give an example of an insertion in the SALE and SALESPERSON relations that violates the referential integrity constraints and of another insertion that does not.
(Level[4], CO[2], PO[3, 4])

UNIT – III

4 a. Define and explain 1NF, 2NF and 3NF with a suitable example. **12 M**
(Level [1,2], CO [3], PO [10])

b. Define Transaction. Briefly explain the READ and WRITE operations in Transaction processing. 08 M

(Level [1,2], CO [4], PO [10])

OR

5 a. Explain BCNF with an example. 04 M

(Level [2], CO [3], PO [10])

b. Explain with example (i) The Lost Update Problem (ii) Incorrect Summary Problem. 06 M

(Level [2], CO [4], PO [10])

c. Briefly explain the different types of transaction failures and also ACID properties. 10 M

(Level [2], CO [4], PO [10])

UNIT – IV

6 a. Write SQL query for the following Database Schema: 10 M

Suppliers (sid : integer. sname : string. address : string)
Parts (pid : integer, pname : string. color : string)
Catalog (sid : integer, pid : integer, cost : real)

i) Write the create table statements for all the tables specifying primary key and foreign key.
ii) Find the sids of suppliers who supply some red and some green parts.
iii) Find the pairs of sids such that the supplier with first sid charges more for some part than the supplier with second sid.
iv) Find the pids of parts supplied by at least two different suppliers.

(Level[3],CO[2],PO[4])

b. Illustrate various DDL commands with an example for each 10 M

(Level[2], CO[2], PO[2])

OR

7 a. Explain SQL syntax with an example for the following SQL statements 10 M
a) CREATE b) ALTER c) UPDATE d) SELECT e) DELETE

(Level[2], CO[2], PO[2,3])

b. Write SQL query for the following Database Schema : 10 M

Works (Pname, Cname, Salary)
Lives (Pname, Street, City)
Located in (Cname, City)
Manager (Pname, Mgrname)

i) Find the names of all persons who live in the city "Bangalore".
ii) Retrieve the names of all person of "Infosys" whose salary is between Rs 50,000 and Rs 90,000.
iii) Find the names of all persons who lives and work in same city.
iv) List the names of the people who work for "Tech M" along with the cities they live in.
v) Find the average salary of "Infosys" person

(Level[3], CO[2], PO[4])

UNIT V

8 a. Discuss the basic structure of a PL/SQL block with its components. 06 M

(Level [2], CO [2], PO [10])

b. Illustrate with suitable examples (i) PL/SQL function (ii) PL/SQL procedure. 08 M

(Level [2], CO [2], PO [1,10])

c. Explain various types of loops available in PL/SQL. Illustrate the syntax with suitable examples. 06 M

(Level [2], CO [2], PO [1,10])

USN : _____ Course Code : 18CS44

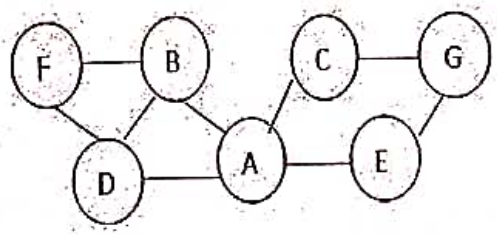
Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021

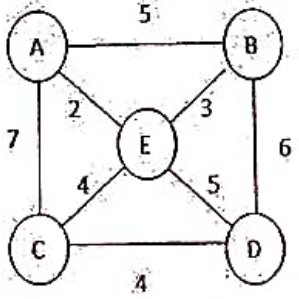
DESIGN AND ANALYSIS OF ALGORITHM

Time: 3 hrs Max. Marks :100

Instructions : Answer any Five full Questions.

	L	CO	PO	M
1a. Explain algorithm design and analysis process with a neat diagram.	[2]	[1]	[1]	[10]
1b. Write Selection Sort algorithm. Apply the algorithm to sort the character array c[10]={"EXAMPLE"}	[3]	[1]	[1]	[10]
2a. Discuss Asymptotic Notations with definition, example and a graph.	[2]	[1]	[1]	[10]
2b. Solve Tower Of Hanoi problem for n=3. Solve recurrence relation and find the order of growth of an algorithm.	[3]	[1]	[1]	[10]
3a. Discuss divide and conquer strategy. Apply Quick Sort to sort the list 5,3,1,9,8,2,4,7. Trace the algorithm and draw the recursive tree.	[3]	[2]	[2]	[10]
3b. Write Depth First Search algorithm and apply it to the following graph. Considering the starting node as A.	[3]	[2]	[2]	[10]
4a. What is a Heap? Apply Heap Sort algorithm to sort the following list. 5,2,8,7,6,9,1,4, Show all the steps.	[3]	[2]	[2]	[10]
4b. Apply Strassen's matrix multiplication algorithm to multiply A_{2x2}=[[1,2],[3,4]] B_{2x2}=[[9,5],[6,7]]	[3]	[2]	[1]	[10]
5a. Apply Prim's algorithm for the following graph to find minimum cost spanning tree.	[3]	[3]	[2]	[10]



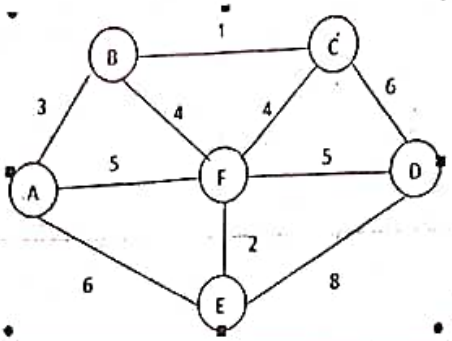


5b. For the given table, Construct a Huffman coding tree and carry out the following operatio
1.encode DAD
2.decode 10011011011101
3.calculate compression ratio

Character	A	B	C	D	_
Probability	0.35	0.1	0.2	0.2	0.15

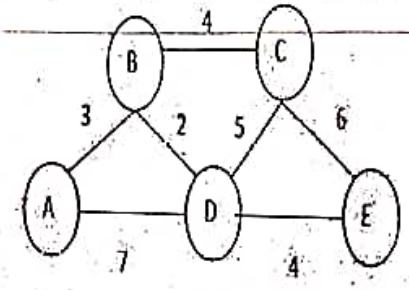
[3] [3] [4]

6a. Write Kruskal's Algorithm and apply it to find minimum cost spanning tree for the follow graph.



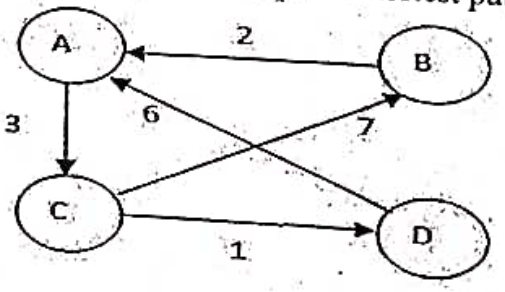
[3] [3] [2]

6b. Apply Dijkstra's Algorithm to find single source shortest path from A.



[3] [3] [2]

7a. Write Floyd's algorithm and apply it to find all pair's shortest path.



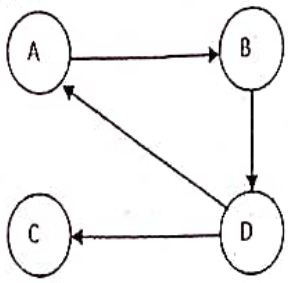
[3] [3] [2]

7b. Discuss Dynamic Programming. Solve the following Knapsack problem using dynam programming. Knapsack Capacity W=5

Item	Weight	Value
1	2	$12
2	1	$10
3	3	$20
4	2	$15

[3] [3] [1]

8a. Write Warshall's algorithm and apply it to find transitive closure of a given graph



[3] [3] [2] [10]

8b. Discuss dynamic programming. Apply it to compute nCr . Build 4 X 4 matrix

[3] [3] [2] [10]

9a. Draw the state space tree to solve 4-queens problem by Backtracking .Find all the solutions.

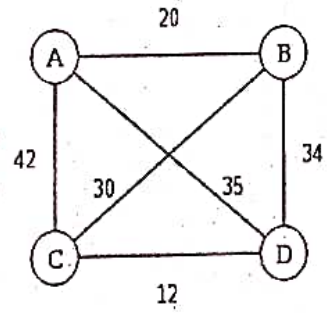
[3] [5] [4] [10]

9b. Illustrate Branch and Bound approach by applying it to the following job assignment problem.

	Job1	Job2	Job3	Job4
Person a	9	2	7	8
Person b	6	4	3	7
Person c	5	8	1	8
Person d	7	6	9	4

[3] [5] [4] [10]

10a. Solve the following Travelling Salesman problem using Branch and Bound technique . Draw State Space tree. Find the optimal solution.



[3] [5] [2] [10]

10b. Apply Horspool's algorithm to find the pattern BARBER in the text JIM_SAW_ME_IN_A_BARBERSHOP. Build Shift table .

[3] [4] [2] [10]

USN : _____ Course Code : 18CS44

Fourth Semester B.E Makeup Examination, SEPT._OCT._2020
DESIGN AND ANALYSIS OF ALGORITHM

Time: 3 hrs Max.Marks :100

Instructions :1. Answer any Five full Questions selecting at least One Full Question from Each Unit. 2. Each Question carry Equal Marks. 3. Missing Data may be suitably assumed. 4. Draw Figures wherever necessary.

MODULE 1 L CO PO M

1a. Illustrate the process of algorithmic design and analysis. Explain each step in detail. [2] [1] [1] [8]

1b. Write an sequential search algorithm and perform the average case time efficiency calculation [3] [1] [1] [7]

1c. Explain the process of non-recursive algorithms efficiency calculation along with an example. [2] [1] [1] [5]

OR

2a. Demonstrate the significance of asymptotic notations for time analysis along examples for each. [3] [1] [1] [8]

2b. Write a Bubble sort algorithm and deduce its time efficiency. [4] [1] [2] [7]

2c. What are recurrence relations? Explain their significance in time analysis. [1] [1] [2] [5]

MODULE 2

3a. Apply the Mergesort algorithm to sort M,E,R,G,E,S,O,R,T [3] [2] [2] [6]

3b. Write recursive binary search algorithm and deduce its time performance with respect to different cases of efficiencies. [4] [2] [2] [9]

3c. Explain the use of divide and conquer methodology forTiling-Game Implementation. [2] [2] [4] [5]

OR

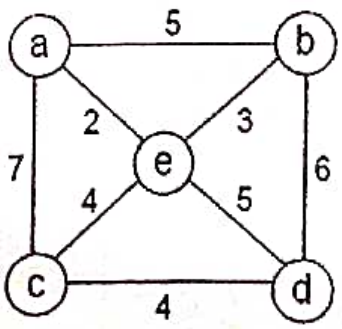
4a. Write pseudocode for a divide-and-conquer algorithm for finding the position of the largest element in an array of 'n' numbers. [3] [2] [4] [6]

4b. Write the Quik sort algorithm and contrast on its three different types time analysis. [2] [2] [2] [8]

4c. ExplainMaze-Game implementation [2] [2] [4] [6]

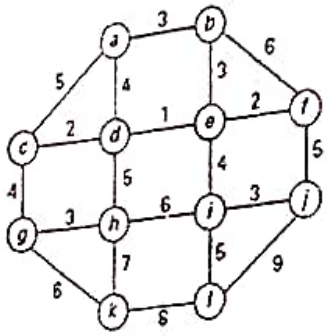
MODULE 3

5a. Apply the Prim's algorithm for the following graph to find the minimum spanning tree and draw the same.



[3] [3] [2] [7]

5b. Solve the following instance of the single-source shortest-paths problem with vertex a as the source using Dijkstra's algorithm:

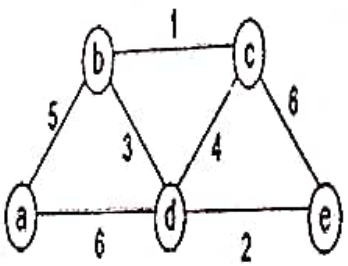


[3] [3]

5c. Write a note on Huffman trees and Huffman Codes [2] [3]

OR

6a. Apply the Krushkals Algorithm for the following Graph to find the minimum spanning tree



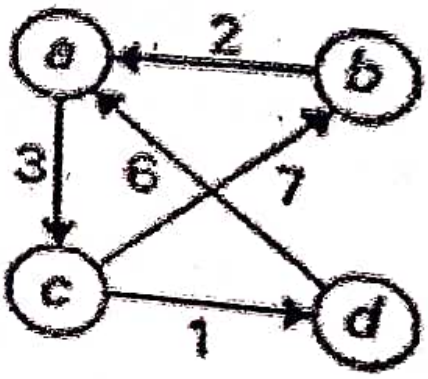
6b. Write the Dijkstras Algorithm and explain its time efficiency calculation. [3] [3]

6c. Develop Huffman code for the following data [2] [3]

symbol	A	B	C	D	_
Frequency	0.4	0.1	0.2	0.15	0.15

MODULE 4 [4] [3]

7a. Write Floyd's algorithm and apply it for the following graph showing the intermediate step



[3] [4]

7b. Explain the bottom-up dynamic programming algorithm and apply the same for the following instance of the knapsack problem, assume the Capacity W = 6.

Item	Weight	Value
1	3	$25
2	2	$20
3	1	$15
4	4	$40
5	5	$50

[3] [4] [4] [10]

OR

8a. Write Warshall's algorithm and apply it to find transitive closure of digraph defined by the following adjacency matrix:

$$\begin{vmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{vmatrix}$$

[3] [4] [4] [10]

8b. Explain the process of computing the nCr using dynamic programming technique.

[2] [4] [4] [5]

8c. Explain the use of dynamic programming to find the solution for Knapsack Problem

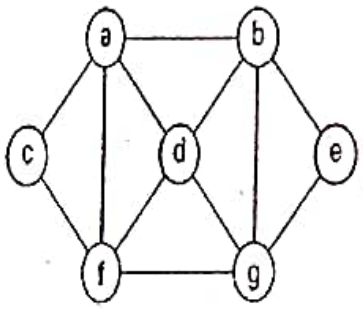
[2] [4] [4] [5]

MODULE 5

9a. Design the state space for solution to 4-Queens problem

[6] [5] [4] [8]

9b. Apply backtracking to the problem of finding a Hamiltonian circuit in the following graph considering 'a' as source vertex



[3] [4] [4] [5]

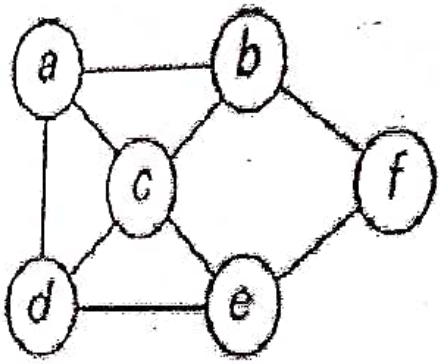
9c. Solve the following instance of the knapsack problem by the branch-and-bound algorithm:

item	weight	value	
1	10	$100	
2	7	$63	W = 16
3	8	$56	
4	4	$12	

[6] [5] [4] [7]

OR

10a. Solve the following graph for 3-color problem using backtracking



10b. Demonstrate the use of Rabin-Karp algorithms for string matching. [6] [5]

10c. Apply Horspool's algorithm to search for the pattern BAOBAB in the text BESS_KNEW_ABOUT_BAOBABS [3] [5]

[3] [5]

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16CS/IS43

Fourth Semester B.E. Semester End Examination, May/June 2018-19

DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours

Max. Marks: 100

Instructions:
1. *Unit I and Unit III are compulsory*
2. *Solve at least one question from remaining units.*
3. *Diagrams if any must be drawn neatly.*

UNIT - I

			L	CO	PO	M
1	a.	Define the term algorithm and illustrate the notion of algorithm with an example.	(2)	(1)	(1)	(06)
	b.	Prove that :if $t_1(n) \in O(g_1(n))$ and $t_2(n) \in O(g_2(n))$ then $t_1(n)+t_2(n) \in O(\max\{g_1(n), g_2(n)\})$	(3)	(1)	(2)	(08)

	c.	Consider the following algorithm:
		Algorithm Mystery(n)
		//input:A non negative integer n
		S ←0
		for i←1 to n do
		S←S+i*i
		return S
		a) What does this algorithm compute? b) What is its basic operation?
		c) How many times the basic operation is executed? d) What is the efficiency class of this algorithm?
			(4)	(1)	(1)	(06)

UNIT – II

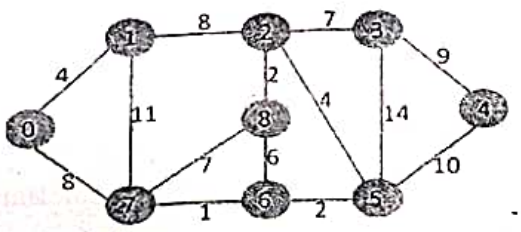
			L	CO	PO	M
2	a.	Write algorithm for binary search. Analyze the algorithm's average case efficiency.	(4)	(2)	(1)	(06)
	b.	Write algorithm for Merge-sort.	(2)	(2)	(1)	(06)
	c.	Explain three variations of decrease and conquer approach. Write the algorithm for breadth first search.	(2)	(2)	(1)	(08)

OR

3	a.	Consider the numbers given below. Show how partitioning function of quick sort algorithm will sort all the elements in the list. Show all the steps clearly. **106, 117, 128, 134, 141, 91, 84, 63, 42.**	(3)	(2)	(1)	(05)
	b.	Write algorithm for HeapBottomUp. Illustrate heap construction for the elements **2, 9, 7, 6, 5, 8.**	(2)	(2)	(1)	(10)
	c.	Write algorithm for depth first search.	(2)	(2)	(1)	(05)

UNIT - III

			L	CO	PO	M
4	a.	Outline Prim's algorithm and find Min-Cost spanning tree for the following graph. Show all the steps in the tabular form.	(3)	(3)	(2)	(10)



Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

b. Construct the Huffman tree and list the codes for the following alphabets

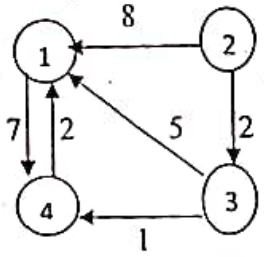
Character	A	B	C	D	E
Frequency	0.4	0.19	0.16	0.15	0.1

(6) (3) (2) (06)

c. Compare DFS and BFS. (3) (3) (2) (04)

UNIT-IV

5 a. Write Floyd's algorithm and solve the all pair shortest path problem for the graph shown below:



(3) (3) (2) (10)

b. Write algorithm to find transitive closure of a graph and illustrate its working with an example.

(2) (3) (2) (10)

L CO PO M

OR

6 a. Write algorithm for memory function knapsack and solve the knapsack instance n=7,{w1,w2,w3,w4,w5,w6,w7}={2,3,5,7,1,4,1}and {p1,p2,p3,p4,p5,p6,p7}= {10,5,15,7,6,18,3} and M=15 by dynamic programming.

(3) (3) (2) (12)

b. Define transitive closure of a graph.. Apply Warshall's algorithm on the graph defined by the following adjacency matrix

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

(3) (3) (3) (08)

UNIT-V

7 a. Given a text *txt[0..n-1]* and a pattern *pat[0..m-1]*, write a function *search(char pat[], char txt[])* that prints all occurrences of *pat[]* in *txt[]*. You may assume that n > m.(where n is no of characters in the text and m is the no of characters in the pattern.

Input: txt[] = "THIS IS A TEST TEXT"
pat[] ="TEST"

(2) (5) (3) (10)

b. Solve the job assignment problem using branch and bound methodology.

9	2	7	8	person a
6	4	3	7	person b
5	8	1	8	person c
7	6	9	4	person d

(3) (5) (3) (10)

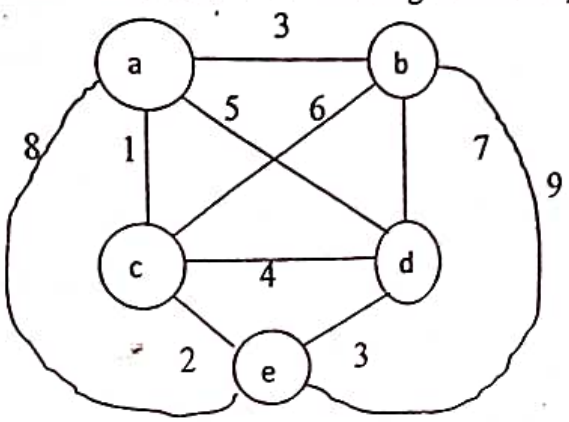
L CO PO M

OR

8 a. Apply backtracking to the following sum of subsets problem instance and find all the solutions by constructing the state space tree.
S={3,2,6,4,1} d=7

(3) (5) (3) (10)

b. With the help of a state space tree, solve the travelling salesman problem using branch and bound technique.



(3) (5) (3) (10)

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16CS/IS43

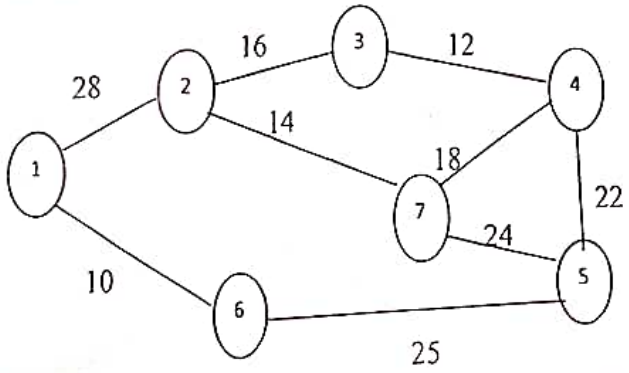
Fourth Semester B.E. Makeup Examination, May/June 2018-19

DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours | Max. Marks: 100

Instructions: 1. *UNIT-I and UNIT-III are compulsory*
2. *Answer any one full question from remaining units*

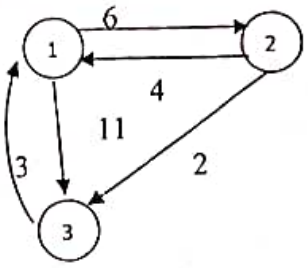
			L	CO	PO	M
		UNIT – I (Compulsory)				
1	a.	Explain design and analysis process with a neat labeled diagram.	(2)	(1)	(1)	(07)
	b.	Explain with appropriate examples three asymptotic notations.	(2)	(1)	(1)	(09)
	c.	If M(n) denotes the number of moves in tower of Hanoi puzzle when n disks are involved, give a recurrence relation for M(n) and solve this recurrence relation.	(4)	(1)	(1)	(04)
		UNIT – II				
2	a.	Write an algorithm for insertion sort .Analyze its worst case efficiency.	(4)	(2)	(2)	(08)
	b.	Write Quick sort algorithm and apply the same on the following list and draw recursive call tree :10,80,30,90,40,50,70.	(3)	(2)	(2)	(08)
	c.	Find the upper bound of recurrences given below by substitution method. a) $T(n) = 2T(n/2)+1$ b) $T(n) = T(n-1)+n$	(3)	(2)	(2)	(04)
		OR				
3	a.	Outline the heapsort algorithm along with Heapify function and apply the same for the following list 15, 19, 10, 7, 17, 16 using heap sort. Show all the steps for sorting the list.	(3)	(2)	(2)	(10)
	b.	Design an algorithm for binary search, Give an example. Show that the worst case efficiency of binary search is $\theta(\log n)$.	(4)	(2)	(2)	(06)
	c.	Write an algorithm for merge sort .Analyze its efficiency.	(4)	(2)	(2)	(04)
		UNIT – III (compulsory)	L	CO	PO	M
4	a.	Write Prim's algorithm to find minimum cost spanning tree.	(2)	(3)	(1)	(06)
	b.	Write Dijkstra's algorithm to find single source shortest paths.	(2)	(3)	(1)	(06)
	c.	Determine minimum cost spanning tree for the graph using prim's algorithm. Show the steps in tabular form.	(3)	(3)	(2)	(08)



Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

UNIT - IV

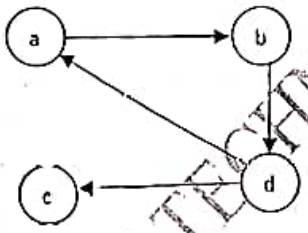
			L	CO	PO	M
5	a.	Write Floyds algorithm for all pairs shortest paths problem.	(2)	(4)	(1)	(06)
	b.	Apply Floyd's algorithm to the graph shown below.				



	c.	Define dynamic programming and show how it is applied to compute 5C3. Show the recurrence relation used and the computations in tabular form.	(3)	(4)	(2)	(07)

OR

6	a.	Write Warshal's algorithm to construct the transitive closure of a given digraph.	(3)	(4)	(1)	(07)
	b.	Apply Warshal's algorithm to find the transitive closure for the digraph shown below.				



			(3)	(4)	(2)	(10)

UNIT -V

			L	CO	PO	M
7	a.	Describe Horspool's algorithm with pseudo code using input enhancement in string matching.	(2)	(5)	(3)	(10)
	b.	With necessary state space tree for N queens problem, explain the solving of 4 queens problem by backtracking.	(2)	(5)	(3)	(10)

OR

8	a.	Explain Hamiltonion circuit problem. Apply backtracking method to solve subset sum problem for the instance S={1,2,3,5,6,7} and d=15.	(3)	(5)	(2)	(10)
	b.	Solve the following assignment problem.				

$$C = \begin{array}{c} \begin{matrix} \text{job1} & \text{job2} & \text{job3} & \text{job4} \end{matrix} \\ \begin{bmatrix} 9 & 2 & 7 & 8 \\ 6 & 4 & 3 & 7 \\ 5 & 8 & 4 & 8 \\ 3 & 9 & 9 & 4 \end{bmatrix} \end{array} \begin{matrix} \\ \text{person a} \\ \text{person b} \\ \text{person c} \\ \text{person d} \end{matrix}$$

			(3)	(5)	(2)	(10)

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CS/IS44/16CS/IS43

Fourth Semester B.E. Semester End Examination, May / June 2018
DESIGN AND ANALYSIS OF ALGORITHMS

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *Answers must be to the point*
2. *Diagrams if any must be neatly drawn*
3. *Unit I and Unit III are compulsory*

UNIT - I

1 a. Define the term Algorithm and illustrate the notion of Algorithm with an example. **04 M**
(Level [2], CO [1], PO [1])

b. Illustrate with a neat diagram the three asymptotic notations. **06 M**
(Level [2], CO [2], PO [2])

c. Enlist the procedure to analyze recursive algorithms and apply the same to the following program to estimate the computing time. **10 M**

```
ALGORITH SUMSQB(n)
Input : A positive integer
Begin
        if  n = 1  then return 1
else return     SUMSQB(n-1) + n*n*n
```

(Level [3], CO [2], PO [2])

UNIT – II

2 a. Apply the mergesort algorithm to sort the list E,X,A,M,P,L,E in alphabetical order **06 M**
(Level [3], CO [3], PO [2])

b. Deduce the performance of binary search algorithm for best case, average case and worst case efficiencies **07 M**
(Level [4], CO [2], PO [2])

c. Write an insertion sort algorithm and deduce its performance with respect to time. **07 M**
(Level [3], CO [3], PO [2])

OR

3 a. Discuss the DFS and BFS apply them for graph shown in figure 1 **10 M**

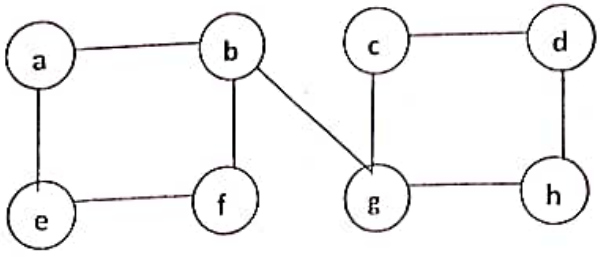

Fig. 3 a

(Level [3], CO [3], PO [2])

b. Construct an algorithm for heap sort and build a heap for the list 1,8,6,5,3,7,4 **10 M**
(Level [3], CO [2,3], PO [2])

UNIT - III

4 a. Apply the Greedy approach to solve the following Knapsack problem **04 M**
w={6,2,2,3,7} p={12,6,8,9.14} and capacity W=13
(Level [3], CO [2], PO [2])

b. Outline Prim's Algorithm and find Min-Cost spanning tree for the following graph. 06 M

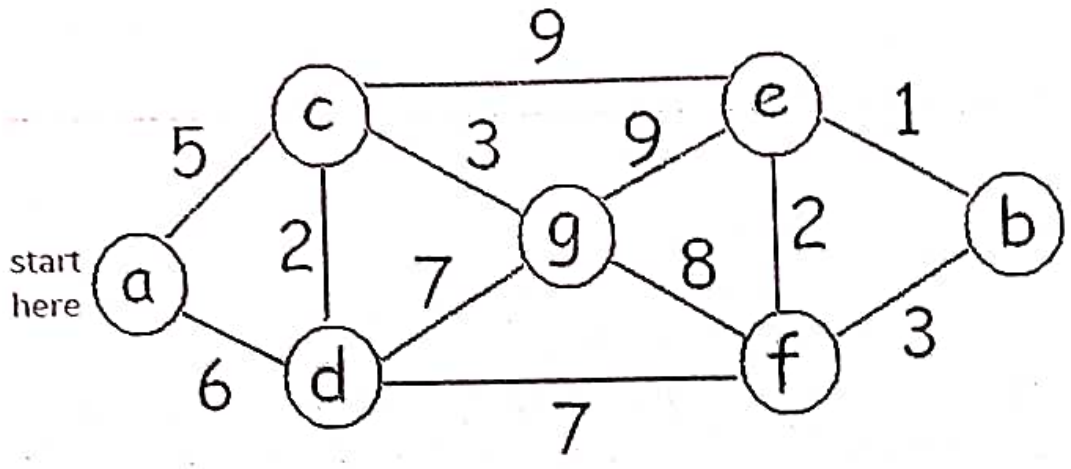

Fig. 4b. Graph G(V,E) – Min.Cost Spanning Tree

(Level [3], CO [2], PO [2])

c. Outline Bellman Ford Algorithm and Justify its use for graphs with negative edges. 06 M

(Level [3], CO [4], PO [4])

d. Construct the Huffman tree and list the codes for the following alphabets 04 M

R	S	T	U	Z
0.43	0.17	0.13	0.19	0.08

(Level [3], CO [5], PO [4])

UNIT - IV

5 a. Illustrate Warshall's algorithm and apply the same to find the transitive closure of the digraph defined by the adjacency matrix shown in Fig 5 a. 10 M

$$\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

Fig. 5 a

(Level [3], CO [3], PO [1])

b. Explain floyd's algorithm and apply the same for the graph given in fig. 4. 10 M

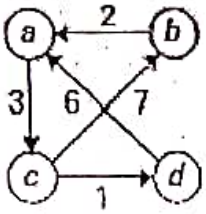

Fig 4.

(Level [3], CO [3], PO [1])

OR

6 a. What is Dynamic programming? Explain 0/1 knapsack algorithm using dynamic programming with an example for the same. 08 M

(Level [2], CO [3], PO [2])

b. Apply the dynamic programming techniques to solve traveling sales person problem for graph given in fig 6 b. The edge length are given in matrix. 06 M

$$\begin{pmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{pmatrix}$$

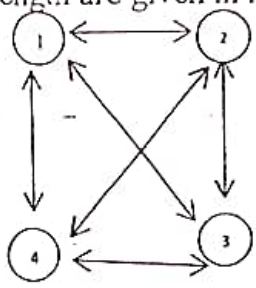

Fig. 6 b

(Level [3], CO [3], PO [1,2])

c. Illustrate the method of computing the value of nCr using dynamic programming. 06 M

(Level [3], CO [3], PO [2])

UNIT -V

7 a. List Horspools algorithm and illustrate its working with an example. 08 M

(Level [3], CO [3], PO [4])

b. List Rabin Karp Algorithm and explain its working with an example. Also Discuss its time complexity. 12 M

(Level [2], CO [3], PO [2])

OR

8 a. List the N-Queens Algorithm and with the help of state space diagram explain its working. 07 M

(Level [2], CO [3], PO [2])

b. List the algorithm to find the sum of subsets for a given problem instance. Apply the same to construct the state space tree for the following problem. 08 M

A[]={5,6,3,1,4,2} and d=9. Find all solutions.

(Level [3], CO [3], PO [2])

c. Explain how solution can be found for TSP using Branch and Bound approach. 05 M

(Level [2], CO [4], PO [2])

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16CS43 / 16IS43

Fourth Semester B.E. Makeup Examination, June 2018

DESIGN AND ANALYSIS OF ALGORITHM

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *Answer five full questions by selecting at least one question from each unit*
2. *UNIT-I and III are compulsory*

UNIT – I (compulsory)

1 a. Define the term algorithm and list the important points that algorithm should satisfy. **05 M**
(Level [1], CO [1], PO [1])

b. Show the process of algorithmic design and analysis Explain each step in detail. **08 M**
(Level [2], CO [1,4], PO [1])

c. Build sequential search algorithm and compute its average case efficiency. **07 M**
(Level [3], CO [2], PO [2])

UNIT – II

2 a. With a neat diagram explain the General Divide and Conquer strategy. **04 M**
(Level [L2], CO [3], PO [2])

b. Outline the MergeSort algorithm and compute its time complexity. **06 M**
(Level [L3], CO [2], PO [2])

c. Outline the Quick Sort algorithm and Analyze its worst computing time. Apply the algorithm to the following problem instance to sort the numbers in ascending order. **10 M**
A[]= { 5, 6, 7, 1, 2, 9, 11, 18, 3 }
(Level [L3], CO [2], PO [2])

OR

3 a. Give the general procedure to solve a problem with Decrease and Conquer approach.. **04 M**
(Level [2], CO [2], PO [2])

b. Write the Insertion Sort algorithm and show that its computing time is $O(n^2)$ **06 M**
(Level [3], CO [2], PO [2])

c. Outline the HeapSort algorithm along with Heapify function and apply the same to the following instance and illustrate how sorting is accomplished. **10 M**
A[] = {3, 4, 7, 5, 1, 6, 7}
(Level [3], CO [2], PO [2])

UNIT – III (compulsory)

4 a. Write the Prim's algorithm and apply the same for graph in fig. 4 a **10 M**

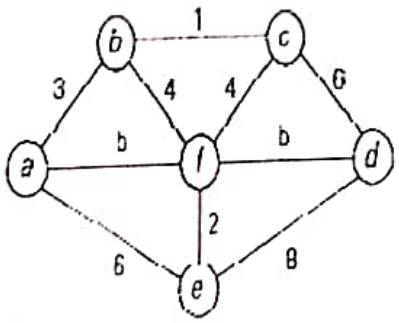

Fig. 4 a

(Level [3], CO [3], PO [2])

b. Explain the Huffman algorithm and build the Huffman tree to generate non-prefix code for the symbols in following table: **10 M**

symbol	A	B	C	D	_
frequency	0.4	0.1	0.2	0.15	0.15

(Level [3], CO [4], PO [2])

UNIT – IV

5 a. List the algorithm to compute nCr and discuss its complexity. 04 M

(Level [1,3], CO [2], PO [2])

b. Write an algorithm to find shortest path between all pairs of a graph and illustrate with an example. 06 M

(Level [1,3], CO [3], PO [4])

c. Write the 0/1 knapsack algorithm that uses dynamic programming approach and apply the same to solve the following problem instance. Given that the sack capacity W=16 10 M

Item No.	Weight	Profit
1	6	25
2	5	36
3	2	65
4	4	45
5	3	18

(Level [1,3], CO [3], PO [4])

OR

6 a. List Warshall's Algorithm and illustrate its working with an example. 10 M

(Level [1,3], CO [3], PO [4])

b. Illustrate with an example how Dynamic programming approach can be applied to find a solution to TSP. 10 M

(Level [1,3], CO [3], PO [4])

UNIT -V

7 a. Explain Horsepool's algorithm and illustrate the same to match the string BAOBAB in the text BESS_KNEW ABOUT_BAOBABS 10 M

(Level [3], CO [5], PO [1,2])

b. Solve the 4-queens problem using backtracking show the tree of deduction. 10 M

(Level [3], CO [2,3], PO [1,2])

OR

8 a. Apply backtracking to solve the instance of the subset sum problem: A = {1, 3, 4, 5} and d = 11. 05 M

(Level [3], CO [3], PO [2])

b. Explain the job assignment problem and solve the same for following instance shown in fig 5. 10 M

	job 1	job 2	job 3	job 4	
$C =$	9	2	7	8	person *a*
	6	4	3	7	person *b*
	5	8	1	8	person *c*
	7	6	9	4	person *d*

Fig. 5

(Level [3], CO [3], PO [4])

c. Illustrate backtracking technique of solving Hamilton circuit problem with an example for the same. 05 M

(Level [3], CO [3], PO [1,2])

symbol	A	B	C	D	_
frequency	0.4	0.1	0.2	0.15	0.15

(Level [3], CO [4], PO [2])

UNIT – IV

5 a. List the algorithm to compute nCr and discuss its complexity. 04 M

(Level [L1], CO [2], PO [2])

b. Write an algorithm to find shortest path between all pairs of a graph and illustrate with an example. 06 M

(Level [L3], CO [3], PO [4])

c. Write the 0/1 knapsack algorithm that uses dynamic programming approach and apply the same to solve the following problem instance. Given that the sack capacity W=16. 10 M

Item No.	Weight	Profit
1	6	25
2	5	38
3	2	65
4	4	45
5	3	18

(Level [L3], CO [3], PO [4])

OR

6 a. List Warshall's Algorithm and illustrate its working with an example 10 M

(Level [L3], CO [3], PO [4])

b. Illustrate with an example, how Dynamic programming approach can be applied to find a solution to TSP. 10 M

(Level [L3], CO [3], PO [4])

UNIT -V

7 a. Explain Horsepool's algorithm and Illustrate the same to match the string **BAOBABin** the text **BESS_KNEW ABOUT_BAOBABS** 10 M

(Level [3], CO [5], PO [1,2])

b. Solve the 4-queens problem using backtracking show the tree of deduction. 10 M

(Level [3], CO [2,3], PO [1,2])

OR

8 a. Apply backtracking to solve the instance of the subset sum problem: A = {1, 3, 4, 5} and d = 11. 05 M

(Level [3], CO [3], PO [2])

b. Explain the job assignment problem and solve the same for following instance shown in fig 5. 10 M

	job 1	job 2	job 3	job 4	
$C =$	9	2	7	8	person a
	6	4	3	7	person b
	5	8	1	8	person c
	7	6	9	4	person d

Fig. 5

(Level [3], CO [3], PO [4])

c. Illustrate backtracking technique of solving Hamilton circuit problem with an example for the same. 05 M

(Level [3], CO [3], PO [1,2])

USN : _____ Course Code : 18CS45

Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER_2021

SOFTWARE ENGINEERING

Time: 3 hrs Max. Marks :100

Instructions : Answer any five full questions. Assume missing data

	L	CO	PO	M
1a. Define Software Engineering, List and Explain essential attributes of good software?	[2]	[1]	[1]	[6]
1b. With a neat diagram explain waterfall model? Explain the problems involved in waterfall model?	[2]	[1]	[1]	[6]
1c. List and explain Software Engineering (ACM/IEEE) Code of Ethics and Professional Practices?	[2]	[1]	[8]	[8]
2a. Explain the difference between Generic and Customized product with example?	[2]	[1]	[1]	[6]
2b. Compare and differentiate between Change avoidance & Change tolerance with example.	[4]	[1]	[1]	[6]
2c. Explain Reuse-oriented developmental model with a neat diagram? Also discuss the benefits of this model as compared to waterfall model?	[2]	[1]	[1]	[8]
3a. With the neat diagram explain the types of non-functional requirements?	[2]	[1]	[1]	[6]
3b. Identify and explain 03 Functional and 03 Non-Functional requirements for the GIT Examination software system.	[3]	[1]	[12]	[6]
3c. Explain in brief the structure of a requirements document that is based on an IEEE standard for requirements documents.	[2]	[1]	[1]	[8]
4a. Explain with a neat diagram the different steps in the requirements elicitation and analysis process?	[2]	[1]	[1]	[6]
4b. Describe different metrics for specifying non-functional requirements?	[2]	[1, 2]	[1]	[6]
4c. List the different formats of specifying system requirement specification. For student admission process in engineering colleges under CET/COMEDK/MANAGEMENT Quota. Use any one of the function you have identified related to admission process and represent it using structured form based specification method.	[4]	[1]	[3]	[8]
5a. Explain Context model with an example	[2]	[1]	[1]	[6]
5b. Develop a set of Use Cases that would serve as bases for understanding the requirement for a Software Engineering attendance management system. Note: Actors: Faculty, Students, COE, Dean academics, University.	[3]	[2]	[3]	[6]
5c. With a neat diagram explain the flow of Analysis model into the design model	[4]	[4]	[3]	[8]
6a. With a neat diagram explain the difference between plan driven development and Agile Development	[2]	[1]	[1]	[6]
6b. List and Explain Extream programming practices.	[2]	[3]	[1]	[6]

6c. Analyze the credit card due payment method in Banking Application, design 1 story card,2 task cards and 2 test cards for the same.

[2] [3] [1] [8]

7a. Describe the factors affecting Software Pricing.

[2] [3] [1] [5]

7b. With a neat diagram explain the project planning process.

[2] [2] [1] [7]

7c. Draw the 'Activity Bar-chart' for the following project schedule.

Task	Duration	Dependency
T1	10	
T2	15	
T3	15	T1(M1)
T4	10	
T5	10	T2,T4(M3)
T6	5	T1,T2(M4)
T7	20	T1(M1)
T8	25	T4(M2)
T9	15	T3,T6(M5)
T10	15	T7,T8(M6)

[3] [2] [3] [8]

8a. List the Project Plan sections and also explain in brief the various Project plan supplements.

[2] [3] [1] [6]

8b. Discuss algorithmic cost modeling formula to show the efforts put in to predict project costs

Calculate the Effort where organizational dependent constant is 2, B=1.05, Multiplier is 2, size is 10.

[3] [3] [3] [6]

8c. Define Project Scheduling. With a neat diagram explain project scheduling process in a plan driven project?

[2] [2] [11] [8]

9a. Explain with a neat diagram input-output model for program testing.

[2] [4] [1] [6]

9b. With a neat diagram explain test driven development process .

[2] [4] [1] [6]

9c. Elective Subject allocation for 7thsemester students is done by the Head of the Department of CSE through web interface software. Analyze the given requirements and design test cases for the same by using Requirements-based testing. "For the 7 semester students of the CSE, department needs to allocate Elective subject based on student's previous semester academic performance and the subject preferences given by the student in the subjects of relative domain. If a student has performed less in a particular domain, then allocation of an elective in a relative domain shall produce warning message being issued to the Head of the department. If the Head of the Department chooses to ignore the warning, then he has to provide valid reason why this warning has been ignored" .

[4] [4] [3] [8]

10a. Explain with a neat diagram model of software testing.

[2] [4] [1] [6]

10b. Define equivalence partition testing? Analyze the following scenario by using equivalence partition method (Identify valid and invalid partitions), Assume we have to test a text field (Name) that accepts the length between 6-12 characters.

[4] [4] [3] [6]

10c. With a neat diagram explain acceptance testing process and also discuss its stages.

[2] [4] [1] [8]

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16CS/IS53

Fifth Semester B.E. Makeup Examination, January 2020

SOFTWARE ENGINEERING

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *All units carry equal marks*
2. *Answer (1) question from each unit.*

UNIT - I

			L	CO	PO	M
1	a.	List and explain all attributes of a 'Good Software'. Which are the key challenges for software engineering? Write a brief note on each.	(2)	(1)	(1)	(08)
	b.	Describe 'Software Engineering Ethics' justifying the professional responsibility, which is not bound by laws.	(2)	(1)	(1)	(07)
	c.	Define software process. List all process activities and explain them in the context of any one software process model.	(2)	(2)	(1)	(05)

OR

2	a.	Explain features of 'Professional Software Development'. Write at least 5 important questions asked frequently about the professional software development with the solutions.	(2)	(1)	(1)	(05)
	b.	Write a note on the following: i) Software Engineering diversity. ii) Software Engineering and the web.	(2)	(2)	(1)	(07)
	c.	Explain the process of 'Coping with Changes'. Illustrate the features of Boehm's spiral model with a neat diagram.	(2)	(2)	(2)	(08)

UNIT – II

			L	CO	PO	M
3	a.	Distinguish 'Plan Driven' and 'Agile Development' methods with their features and relevant diagram.	(4)	(3)	(3)	(06)
	b.	Illustrate 'Extreme Programming 'reflecting the principles of agile methods.	(2)	(2)	(2)	(06)
	c.	Describe project scheduling with the figure showing different processes involved. Which are the most common used schedule representations?	(2)	(2)	(1)	(08)

OR

4	a.	Explain the effect of Software Pricing and the factors involved. Give an example.	(2)	(3)	(2)	(07)
	b.	Categorize types of project plans with a brief note on each. Which are the main sections normally considered in the project details?	(4)	(3)	(3)	(07)
	c.	Write a note on 'Agile Planning' and its approach using extreme programming.	(2)	(2)	(1)	(06)

UNIT - III

			L	CO	PO	M
5	a.	Apply that you are developing software for INDIAN RAILWAYS. Identify and explain at-least FOUR functional requirements and TWO non-functional requirements for the same.	(3)	(2)	(2)	(08)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

b. Explain, what is a requirement? List the different types of requirement with examples.

(2) (3) (1) (06)

c. List and explain the metrics for specifying non-functional requirements.

(2) (3) (1) (06)

OR

6 a. List and explain the structure of a requirement document.

(3) (2) (2) (08)

b. List the readers of different types of requirement specifications. Differentiate between functional and non-functional requirements.

(2) (3) (1) (06)

c. Differentiate between Natural Language Specification and Structured Specification.

(2) (3) (1) (06)

UNIT - IV

L CO PO M

7 a. Describe how object-oriented systems approach is better than functional approach to accommodate the changes to existing system. Give an example.

(2) (3) (2) (07)

b. Draw the model of traditional software testing process and explain the types of testing phases.

(3) (2) (2) (06)

c. Define 'Design Models'. Explain how they are classified using UML?

(2) (2) (1) (07)

OR

8 a. Classify and explain the objectives of three types of testing used in 'Development Testing'.

(4) (2) (2) (08)

b. Explain 'System Context and Interactions' involved during system design.

(2) (1) (1) (06)

c. Illustrate 'Input-Output model' of software testing with explanation for verification, validation, software purposes and user requirements.

(2) (2) (2) (06)

UNIT -V

L CO PO M

9 a. What is 'Version Management'? Explain all five ranges of features that 'Version Management System' provides.

(2) (2) (1) (10)

b. Describe the software 'Change Management'. Explain all significant factors that should be taken into account to decide over the change.

(2) (1) (1) (10)

OR

10 a. Define 'Quality Attribute'. Write a note on all quality attributes involved for software development.

(1) (1) (1) (06)

b. Write a note on product standards and process standards.

(2) (2) (2) (07)

c. Describe the quality standards and the associated ISO 9001 framework.

(2) (1) (1) (07)

USN : _____ Course Code : 16CS/IS53

Semester B.E FASTTRACK Examination, OCTOBER_NOVEMBER_2020

SOFTWARE ENGINEERING

Time: 3 hrs Max.Marks :100

Instructions :1.Answer any Five full Questions selecting at least One Full Question from Each Unit. 2. Each Question carry Equal Marks. 3. Missing Data may be suitably assumed.

MODULE 1 **L CO PO M**

1a. List and explain all attributes of a 'Good Software'. Which are the key challenges for software engineering? Write a brief note on each.

[1] [1] [1] [8]

1b. Describe 'Software Engineering Ethics' justifying the professional responsibility, which is not bound by laws.

[2] [2] [2] [7]

1c. Define software process. List all process activities and explain them in the context of any one software process model.

[1] [2] [1] [5]

OR

2a. Explain features of 'Professional Software Development'. Write 5 important questions asked frequently about the professional software development with the solutions.

[1] [2] [1] [5]

2b. Write a note on the following:
I) Software Engineering Ethics
II) Software Engineering Diversity & Examples

[2] [2] [2] [7]

2c. Explain the process of 'Coping with Changes'. Illustrate the features of Boehm's spiral model with a neat diagram.

[3] [2] [2] [8]

MODULE 2

3a. Distinguish 'Plan Driven' and 'Agile Development' methods with their features and relevant diagram.

[2] [2] [2] [6]

3b. Illustrate 'Extreme Programming 'reflecting the principles of agile methods.

[3] [2] [3] [6]

3c. Describe project scheduling with the figure showing different processes involved. Which are the most common used schedule representations?

[2] [2] [1] [8]

OR

4a. Explain the effect of Software Pricing to the customers and the factors involved using examples.

[2] [2] [2] [7]

4b. Write a note on 'Agile Planning' and its approach using extreme programming.

[2] [1] [1] [6]

4c. Write a note on 'Agile Planning' and its approach using extreme programming.

[2] [1] [1] [6]

MODULE 3

5a. Distinguish 'User level' and 'System level' requirement. Giving an example show the changes in requirement description at different levels of process.

[3] [2] [2] [6]

5b. Classify and explain functional & non-functional requirements. With a block diagram show the non-functional types of requirement. [2] [2] [1] [8]

5c. Describe all the process activities. Draw a block diagram of 'Requirements Elicitation and Analysis' with note on its importance. [1] [1] [1] [6]

OR

6a. Describe the requirement specification and the notations used. Distinguish Natural Language specification and structured specification. [4] [2] [2] [10]

6b. Illustrate the requirements elicitation and analysis process. List the difficulties in 'Eliciting and Understanding' requirements from system stakeholders. [3] [3] [2] [10]

MODULE 4

7a. Describe the way object-oriented systems approach accommodates changes to existing systems compared to functional approach. Make use of any example if required. [2] [2] [1] [7]

7b. Discuss the traditional software testing process model with block diagram. Explain the three types of testing phases involved. [2] [1] [1] [6]

7c. Define 'Design Model'. Classify and explain the design models using UML. [2] [2] [1] [7]

OR

8a. Classify and explain the objectives of 3 types of testing used in 'Development Testing'. [2] [2] [2] [8]

8b. Elaborate on 'System Context and Interactions' involved during system design. [2] [1] [1] [6]

8c. Illustrate 'Input-Output model' of software testing with explanation for verification, validation, software purposes and user requirements. [3] [2] [2] [6]

MODULE 5

9a. Show the 3 principle concerns of quality management with software development by a block diagram. List all quality attributes applicable to the software developments with a brief note [3] [3] [2] [8]

9b. Give the reasons that make software standards are important. [2] [2] [1] [5]

9c. Describe the ISO 9001 standards framework and its processes imply quality management process. [2] [2, 3] [2] [7]

OR

10a. Demonstrate the changes incorporated in large software systems, based on changing requirements of an organization with a block diagram [3] [2] [3] [10]

10b. Show the 'Version Management' use in software industry. Classify and explain the range of features it involves. [3] [2] [2] [10]

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15CS53/16CS/IS53

Fifth Semester B.E. Semester End Examination, Dec/Jan 2018-19

SOFTWARE ENGINEERING

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *Answer any five Full Questions*
2 *Unit – I and Unit V are compulsory units.*

UNIT – I

		L	CO	PO	M
a.	With neat diagram explain the Water fall model.	(2)	(2)	(1)	(05)
b.	Explain essential attributes of good software and also explain the general issues that affect various types of software?	(2)	(1)	(2)	(07)
c.	List the eight principles to be followed by any software engineer.	(1)	(1)	(2)	(08)

UNIT – II

		L	CO	PO	M
a.	Distinguish between plan-driven and agile method. Mention the factors to be considered while choosing between plan-driven and agile method.	(2)	(2)	(1)	(10)
b.	List and explain principles of Extreme programming	(2)	(2)	(1)	(10)

OR

		L	CO	PO	M
a.	List the factors affecting software pricing ? Justify your answer.	(1)	(1)	(1)	(05)
b.	Construct a Bar chart for the given details of tasks, duration and dependencies.				

Tasks	Duration(days)	Dependencies
T1	10	
T2	15	T1
T3	10	T1,T2
T4	20	
T5	10	
T6	15	T3,T4
T7	20	T3
T8	35	T7
T9	15	T6
T10	5	T5,T9

		(2)	(1)	(1)	(08)
c.	With a neat diagram explain the project planning process.	(2)	(3)	(3)	(07)

UNIT - III

		L	CO	PO	M
a.	Distinguish between Functional and Non-functional requirements. With a block diagram, explain the types of non-functional requirements.	(4)	(2)	(2)	(10).
b.	Explain the any five Metrics for specifying non-functional requirements?	(2)	(1)	(2)	(05)
	...users of a requirements document?				

			L	CO	PO	M
		OR				
5	a.	Explain the structure of a requirement document.	(2)	(3)	(2)	(07)
	b.	Mention the different ways of writing system requirements specification?	(2)	(3)	(2)	(05)
	c.	Reliance is planning for an online shopping mart. List and briefly explain the non-functional requirements for the application?	(3)	(2)	(2)	(08)
		UNIT - IV	L	CO	PO	M
6	a.	Using the graphical notation for object classes, design the object classes, identifying attributes and operations for a 'Library System'. Use your own experience to decide on the attributes and operations that should be associated with this.	(5)	(3)	(3)	(07)
	b.	Explain the weather station system along with its state diagram.	(2)	(2)	(3)	(07)
	c.	Design a high-level architecture of the '*Aadhar* Number generation system'.	(5)	(3)	(3)	(06)
		OR	L	CO	PO	M
7.	a.	Mention the two goals of software testing and explain an input-output model for program testing.	(2)	(4)	(3)	(06)
	b.	What are the advantages of inspection over testing. Explain the process of software testing with a neat diagram.	(2)	(4)	(3)	(08)
	c.	Explain the different types of interface errors and explain any three classes of interface errors.	(2)	(4)	(2)	(06)
		UNIT -V	L	CO	PO	M
8	a.	Explain the ISO 9001 standard framework along with ISO 9001 core processes and its quality management diagram.	(2)	(2)	(3)	(10)
	b.	Explain CM (Configuration management) Terminology+.	(2)	(2)	(2)	(10)

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15CS53/15IS53

B.E. Fasttrack Semester Examination, July/August 2018
SOFTWARE ENGINEERING

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *UNIT I & III are Compulsory.*
2. *Answer any one full question from remaining each UNITS.*

UNIT - I

1 a. Describe two major categories of software products and explain the definition of software engineering. **05 M**

(Level [2], CO [1], PO [1])

b. Explain the different types of applications. **08 M**

(Level [2], CO [1], PO [1])

c. Explain the waterfall model. **07 M**

(Level [2], CO [2], PO [3])

UNIT – II

2 a. List and describe the principles of agile methods **05 M**

(Level [2], CO [2], PO [2])

b. Discuss the point to decide on balance between plan driven and agile approach. **10 M**

(Level [2], CO [2], PO [3])

c. What is pair programming and what are the advantages of it. **05 M**

(Level [1], CO [2], PO [2])

OR

3 a. What are the factors that affect software pricing. **05 M**

(Level [1], CO [3], PO [3])

b. Explain project planning process with a neat diagram. **08 M**

(Level [2], CO [3], PO [3])

c. Discuss the project scheduling process. **07 M**

(Level [2], CO [2], PO [3])

UNIT – III

4 a. List out and explain types of non functional requirements. **07 M**

(Level [2], CO [2], PO [3])

b. Explain the different ways of writing a system requirement specification. **06 M**

(Level [2], CO [3], PO [2])

c. Explain how to write a structured specification of a requirement for an example of insulin pump system. **07 M**

(Level [2], CO [2], PO [3])

UNIT – IV

5 a. What is context and interaction in object oriented design with UML. Explain with an example. **10 M**

(Level [2], CO [4], PO [2])

b. Explain design models and give a sequence diagram for data collection in weather information system. **10 M**

(Level [2], CO [4], PO [2])

OR

6 a. Explain the interface testing, different interface errors and classes of errors. **10 M**

(Level [2], CO [4], PO [1])

b. With an example of weather data collection system explain the system testing. **10 M**

(Level [2], CO [3], PO [2])

UNIT –V

7	a.	Why is software standards are important? Explain two software engineering standards for software quality management? (Level [2], CO [3], PO [3])	05 M
	b.	Explain ISO9001 and quality management with figure. (Level [2], CO [3], PO [2])	10 M
	c.	Explain the process based quality with example. (Level [2], CO [4], PO [3])	05 M

OR

8	a.	List and explain configuration management terminology and configuration management activities. (Level [2], CO [4], PO [3])	10 M
	b.	With the figure, explain change management process and list out point to be considered for change acceptance. (Level [2], CO [4], PO [3])	10 M

USN : _____

Course Code : 18MATCS41

Fourth Semester B.E MAKEUP Examination, AUGUST_OCTOBER 2021
DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY

Time: 3 hrs

Max. Marks :100

Instructions:-Answer any Five full Questions.

	L	CO	PO	M

1a. Simplify the following compound propositions by using laws of logic:
(i) $(p \vee q) \wedge \sim [(\sim p) \wedge q]$,
(ii) $\sim [\sim \{(p \vee q) \wedge r\} \vee \sim q]$,
Where p, q, r are propositions.

[1] [1] [1] [6]

1b. Define converse, inverse and contrapositive of the conditional. Write the converse, inverse and contrapositive of the following conditional:
"If a quadrilateral is a parallelogram, then its diagonals bisect each other"

[2] [1] [1] [7]

1c. Define universal quantifier and existential quantifier. Write down the following propositions in symbolic form and find its negation.
(i) "All integers are rational numbers and some rational numbers are not integers"
(ii) "If all triangles are right-angled, then no triangle is equilateral"

[2] [1] [1] [7]

2a. Define the connectives NAND and NOR. Express the following compound propositions only in terms of NAND and only in terms of NOR connective.
(i) $p \wedge q$,
(ii) $p \rightarrow q$,
where p, q are propositions.

[1] [1] [1] [6]

2b. Define the following rule of inferences.
(i) Rule of syllogism,
(ii) Modus Pones,
(iii) Modus Tillens.
Test the validity of the following argument.
If Ravi goes out with friends, then he will not study.
If Ravi does not study, then his father becomes angry
His father is angry.
∴ Ravi has not gone out with friends.

[2] [1] [1] [7]

2c. Consider the following open statements on the set R of all real numbers.
$p(x): x > 3, q(x): x > 3$.
Find the truth value of the statement $\forall x \in R\ [p(x) \rightarrow q(x)]$.
Also write the converse, inverse, and contrapositive of these statements and their truth values.

[2] [1] [1] [7]

3a. Let $A = \{1, 2, 3, 4, 6\}$ be the set and let R be the relation on set A defined by aRb if and only if "a is multiple of b".
(i) Write down the relation R as a set of order pairs.
(ii) Draw the diagraph of R.
(iii) Determine the in-degree and out-degree of each vertices of diagraph.

[2] [2] [1] [6]

3b. On the set Z of all integers, an equivalence relation R is defined by aRb if and only if $a^2 = b^2$. Determine the partition induced by this relation.

[2] [2] [1] [7]

3c. Let $A=\{1,2,3,4\}$ and $R=\{(1,1),(1,2),(2,2),(2,4),(1,3),(3,3),(3,4),(1,4),(4,4)\}$. Show that R is a partial ordering relation A. Draw the Hasse diagram of R. [3] [2] [1] [7]

4a. Let S be the set of all non-zero integers and A=S×SA=S×S. On A, define the relation R by (a,b)R(c,d)(a,b)R(c,d) if and only if ad=bc. Show that R is an equivalence relation. [2] [2] [1] [6]

4b. If A is a non-empty set, then prove the following.
(i) Any equivalence relation R on A induces a partition of A.
(ii) Any partition of A gives rise to an equivalence relation R on A. [3] [2] [1] [7]

4c. Let $f: X \to Y$ be a function and A and B be arbitrary non-empty subsets of X. Then prove the following.
(i) If $A \subseteq B$, then $f(A) \subseteq f(B)$.
(ii) $f(A \cup B) = f(A) \cup f(B)$. [2] [2] [1] [7]

5a. Let $S(m, n)$ is Stirling numbers of the second kind. Then evaluate the following.
(i) $S(5, 4)$, (ii) $S(8, 6)$. [1] [3] [1] [6]

5b. Solve the linear homogeneous recurrence relation $u_n = u_{n-1} + u_{n-2}$ for $n \geq 3$ with initial conditions $u_1 = 1$, $u_2 = 3$ by using generating function. [2] [3] [1] [7]

5c. Define divide and conquer recurrence relation. Set up a divide and conquer recurrence relation for the merge sort algorithm. [2] [3] [1] [7]

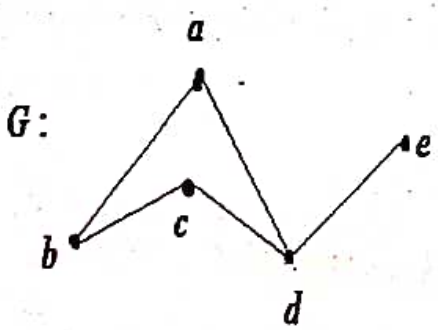
6a. Define the Pigeonhole principle. Find the least number of ways of choosing three different numbers from 1 to 10 so that all choices have the same sum. [1] [3] [1] [6]

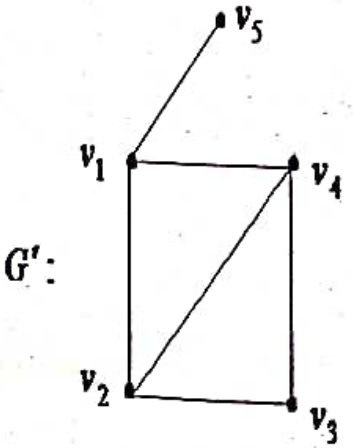
6b. Solve the linear homogeneous recurrence relation $a_n - 8a_{n-1} + 16a_{n-2} = 0$ with initial conditions $a_2 = 6$, $a_3 = 80$ by using characteristic roots. [2] [3] [1] [7]

6c. Solve the linear non-homogeneous recurrence relation $a_{n+2} - 2a_{n+1} + a_n = 2^n$ with initial conditions $a_0 = 2$, $a_1 = 1$ by using generating function. [2] [3] [1] [7]

7a. Define (i) graph, (ii) degree of vertex, (iii) pendent vertex and (iv) adjacent vertex. Draw a graph $G(V, E)$ with:
$V = \{a, b, c, d, e, f\}$, $E = \{(a, d), (a, f), (b, c), (b, f), (c, e)\}$ [1] [4] [1] [6]

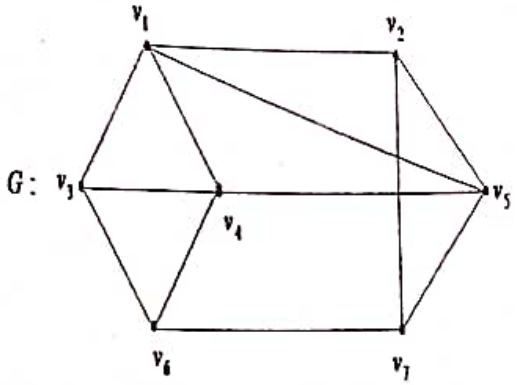
7b. Define complement of a graph and isomorphic graph. Show that graph G and G' shown below are isomorphic.





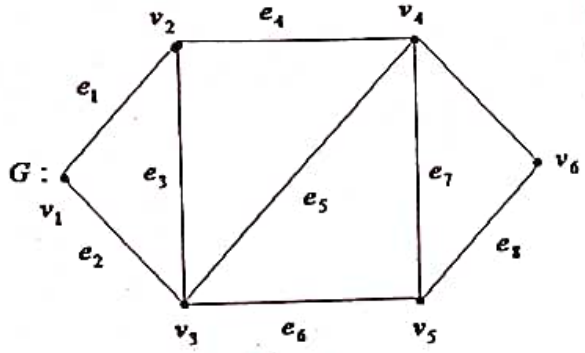
[2] [4] [1] [7]

7c. Consider the graph G given below. Use the Welch-Powell algorithm to paint G with minimum colour. Also, find the chromatic number.



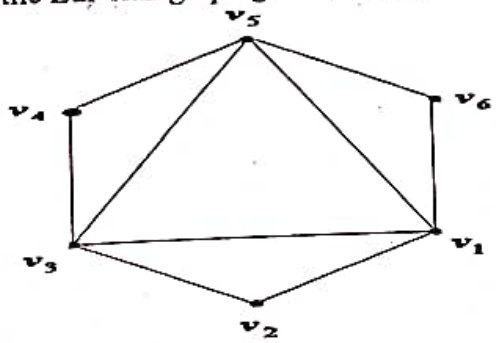
[2] [4] [1] [7]

8a. Define subgraph. Consider the graph G given below. Determine the subgraphs (i) $G - v_1$, (ii) $G \quad v_5$, (iii) $G \quad e_1$, (iv) $G - e_3$.



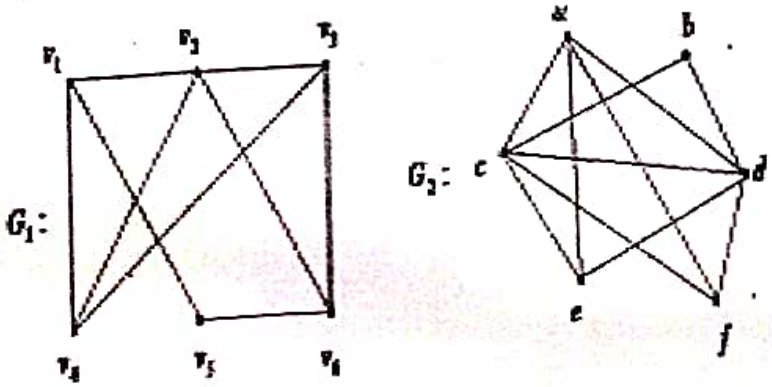
[1] [4] [1] [6]

8b. Define (i) Euler trail, (ii) Euler circuits, (iii) Euler graph.
Write the Eulerian circuits for the Eulerian graph given below.



[2] [4] [1] [7]

8c. Define planar graphs. Draw the planar representation of the following graphs G_1 and G_2.



[2] [4] [1] [7]

9a. Show that GF(7) is a finite field. [2] [5] [1] [6]

9b. Solve the following by using Chinese remainder theorem.
$x \equiv 2(mod\,3),\quad x \equiv 3(mod\,5),\quad x \equiv 2(mod\,7)$. [2] [5] [1] [7]

9c. Describe the RSA encryption and decryption alorithm. [2] [5] [1] [7]

10a. .Let m be a positive integer. If $a \equiv b(mod\,m)$ and $c \equiv d(mod\,m)$, then prove that $a + c \equiv b + d(mod\,m)$ and $ac \equiv bd(mod\,m)$. [2] [5] [1] [6]

10b. State and prove Fermat's theorem. [2] [5] [1] [7]

10c. Perform encryption and decryption using the RSA algorithm for $p=3,\ q=5,\ M=2$. [3] [5] [1] [7]

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16MATCI41 / MATCI41

Fourth semester B.E. Semester End Examination, May/June 2018-19

DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY / ENGINEERING MATHEMATICS-IV

Time: 3 Hours | Max. Marks: 100

Instructions: 1. *Answer any Five full Questions.*
2. *Unit IV and V are compulsory.*

UNIT - I

			L	CO	PO	M
1	a.	Test the Validity of the argument by using laws of logic. $p \rightarrow r$ $r \rightarrow s$ $t \vee \sim s$ $\sim t \vee u$ $\sim u$ $\therefore \sim p$	(3)	(1)	(1)	(06)
	b.	Define Tautology and Contradiction, And Prove that, for any propositions p, q, r the compound proposition $[(p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)] \rightarrow r$ is a Tautology.	(2)	(1)	(1)	(07)
	c.	Write types of Quantifiers. For the following statements the universe comprises all nonzero integers. Determine the truth value of each statement: 1) $\exists x \, \exists y \, , [xy = 1]$ 2) $\exists x \, \forall y \, , [xy = 1]$ 3) $\forall x \, \exists y \, , [xy = 1]$	(1)	(1)	(1)	(07)

OR

2	a.	Write Inverse and Domination laws of logic. Prove that $[(p \rightarrow q) \wedge (\sim q \wedge (r \vee \sim q))] \Leftrightarrow \sim (q \vee p)$ without using truth table	(2)	(1)	(1)	(06)
	b.	Let $p(x): x^2 - 8x + 15 = 0$, $q(x): x \text{ is odd}$, $r(x): x > 0$ with the set of all integers as the universe. Determine the truth or falsity of each of the following statements. 1) $\forall x, [p(x) \rightarrow q(x)]$ 2) $\exists x, [p(x) \rightarrow q(x)]$ 3) $\exists x, [r(x) \rightarrow p(x)]$ 4) $\exists x, [p(x) \rightarrow (q(x) \wedge r(x))]$ 5) $\forall x, [(p(x) \vee q(x)) \rightarrow r(x)]$	(1)	(1)	(1)	(07)
	c.	i) Define 1) Exclusive Disjunction 2) Disjunction 3) Conditional. ii) Let x be a specified number. Write down the negation of the following conditionals: 1) "If x is an integer, then x is a rational number". 2) "If x is not real number, then it is not a rational number and not an irrational number".	(3)	(1)	(1)	(07)

UNIT – II

			L	CO	PO	M
3	a.	Find the nature of the following relations on A = { p , q, r, s} and draw its Digraphs represented by 1) $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}$ 3) $\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$	(1)	(2)	(1)	(06)

Note: L (Level), CO (Course Outcome), PO (Programme Outcome), M (Marks)

b. Define Zero-one matrix. Consider the sets A = { a, b, c} and B = { 1, 2, 3 } and the relations R ={ (a,1), (b,1), (c,2), (c,3)} and S = { (a,1), (a,2), (b,1), (b,2) } from A to B. Determine $\overline{R}$, $(R \cup S)$, S^c and their matrix representation.

(2) (2) (1) (07)

c. On the set of Z of all integers, a relation R is defined by aRb if and only if $a^2 = b^2$. Verify that R is an equivalence relation. Determine the partition induced by this relation.

(1) (2) (1) (07)

OR

4 a. Define Cartesian Product, and Prove that $A \times (B - C) = (A \times B) - (A \times C)$.

(1) (2) (1) (06)

b. Define Equivalence relations.
Let A ={ 1,2,3,4,5,6,7,8,9,10,11,12}. On this set define the relation R by $(x,y) \in R$ if and only if $(x - y)$ is a multiple of 5. Verify that R is an equivalence relation.

(2) (2) (1) (07)

c. Show that the D_{32} is a lattice.

(3) (2) (1) (07)

UNIT - III L CO PO M

5 a. Prove that the function $f: A \to B$ is invertible if and only if it is one-to-one and onto.

(3) (3) (1) (06)

b. A bag contains 12 pairs of socks(each pair in different colors). If a person draws the socks one by one at random,. determine at most how many draws are required to get at least one pair of matched socks.

(2) (3) (1) (07)

c. Define Floor and ceiling Functions with example. Let $A = B = R$ Determine $\prod_A D$ *and* $\prod_B D$ for each of the following sets $D \subseteq A \times B$

$i) D = \{(x,y) | x = y^2, 0 \leq y \leq 2\}$ $ii) D = \{(x,y) | x^2 + y^2 = 1\}$

(1) (3) (1) (07)

OR

6 a. There are six programmers in the computer science department who can assist ten departments in th University. In how many ways can these departments be assisted by the six programmers so that eac is working at least at one department?

(2) (3) (1) (06)

b. State pigeonhole Principle. Consider the functions f and g defined by $f(x) = x^3$ and $g(x) = x^2 + 1, \forall x \in R$ Find $g \circ f, f \circ g, f^2$ *and* g^2.

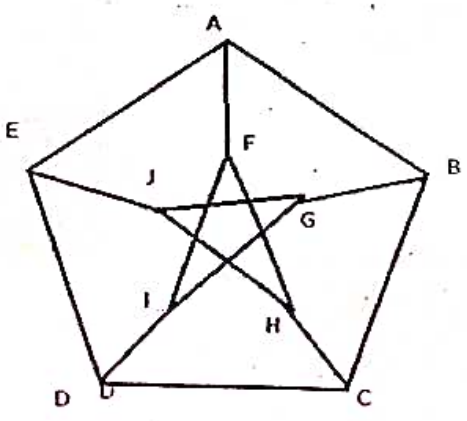
(1) (3) (1) (07)

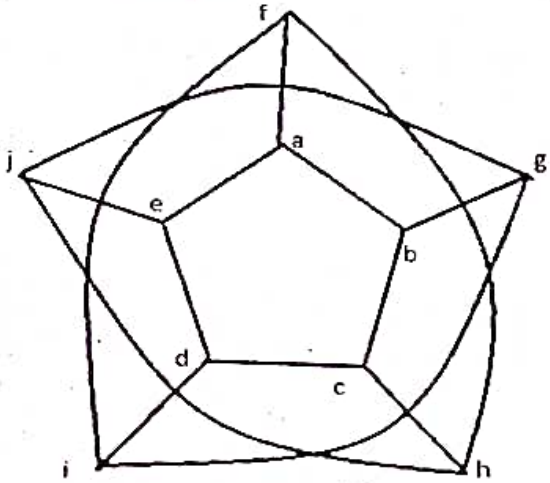
c. Define Generating function. Determine the coefficient of x^8 in $\frac{1}{(x-3)(x-2)^2}$.

(1) (3) (1) (07)

UNIT – IV (Compulsory) L CO PO M

7 a. Define Isomorphism. Show that following two Graphs are isomorphic.





(1) (4) (1) (06)

Define Planar Graph.

1) $G(V,E)$ be a connected planar graph with $|V| = v$ and $|E| = e$. Let r be the number of regions in the plane ,then prove that $v - e + r = 2$

(2) (4) (1) (07)

1) Define Hamiltonian Path, Hamiltonian cycle with examples.

2) Prove that a Graph G is Eulerian if and only if every vertex of G has even degree.

(1) (4) (1) (07)

L CO PO M

UNIT –V (Compulsory)

State and Prove Euler's Theorem.

(2) (5) (1) (06)

State Chinese Remainder Theorem. Solve $x \equiv 0(mod\ 3), x \equiv 2(mod 5), x \equiv 69mod(11)$.

(1) (5) (1) (07)

Explain Testing of Primality.

(1) (5) (1) (07)

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16MATCI41/MATCI41

Fourth Semester B.E. Semester End Examination, May / June 2018
DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY / ENGINEERING MATHEMATICS - IV

Time: 3 Hours

Max. Marks: 100

Instructions: 1. *Questions from unit IV and V are compulsory.*
2. *Answer any ONE Full question from each of other units.*

UNIT - I

1 a. Define tautology, contradiction and contingency with an example each. **06 M**

(Level [1], CO [1], PO [1])

b. Write down the following statement in symbolic form and find its negation, "All integers are not rational numbers and rational numbers are not integers". Also write in words. **07 M**

(Level [2], CO [1], PO [1])

c. Simplify the compound statement (i) $[(p \vee q) \wedge (p \to r) \wedge (q \to r)] \to r$ **07 M**

(ii) $\{p \to (q \to r)\} \to \{(p \to q) \to (p \to r)\}$

(Level [3], CO [1], PO [5])

OR

2 a. Negate and simplify the following (i) $\exists x[p(x) \vee q(x)]$ **06 M**

(ii) $\exists x\{[p(x) \vee q(x)] \to r(x)\}$ (iii) $\exists x\{[p(x) \vee q(x)] \to r(x)\}$

(Level [1], CO [1], PO [1])

b. Simplify the compound statements using the laws of logic (i) $(p \vee q) \wedge (\neg(\neg p \wedge q))$ **07 M**

(ii) $\neg(\neg((p \vee q) \wedge r) \vee \neg q)$

(Level [3], CO [1], PO [1])

c. Test whether the following argument is valid or not **07 M**

$$\begin{array}{l} p \to (q \to r) \\ p \vee \sim s \\ q \\ \hline \therefore s \to r \end{array}$$

(Level [2], CO [1], PO [5])

UNIT – II

3 a. Define Cartesian product. For any non empty sets A, B, C prove the following : **06 M**

(i) $A \times (B \cap C) = (A \times B) \cap (A \times C)$ (ii) $A \times (B - C) = (A \times B) - (A \times C)$

(Level [2], CO [2], PO [1])

b. Find the relation R on the set A={a,b,c,d,e} whose matrix is as follows **07 M**

$$M(R) = \begin{bmatrix} 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 \end{bmatrix}$$

, write down its digraph.

(Level [2], CO [2], PO [1])

c. Define Lattice. Show that D_{36} is a Lattice. **07 M**

(Level [3], CO [2], PO [5])

OR

4 a. Define Reflexive, Antisymmetric and transitive relation on A={a,b,c,d} with examples. **06 M**

(Level [1], CO [2], PO [1])

b. Let S={1,2,3} and P(S) be the power set of S. On P(S) define the relation R by XRY if and only if $X \subseteq Y$. Show that this relation R is a partial order on P(S). Draw its Hasse diagram. 07 M
(Level [2], CO [2], PO [5])

c. Prove that the relation "congruent modulo 7" is an equivalence relation on the set of all integers $\mathbb{Z}$ and hence find partition of $\mathbb{Z}$. 07 M
(Level [3], CO [2], PO [1])

UNIT – III

5 a. If $f: R \to R$ be defined by $f(x) = \begin{cases} 3x-5, for\ x>0 \\ -3x+1, for\ x \le 0 \end{cases}$ Determine $f^{-1}(3), f^{-1}(-3), f^{-1}([-5,5])$ and $f^{-1}([-6,5])$. 06 M
(Level [2], CO [3], PO [1])

b. Let $f: X \to Y$ be a function and A & B be arbitrary non empty subsets of X, then prove that $f(A \cap B) \subseteq f(A) \cap f(B)$ and the equality holds if f is one to one function. 07 M
(Level [2], CO [3], PO [1])

c. Let A={1,2,3,4} and B={1,2,3,4,5,6} (i) Find how many functions are there from A to B. How many are one to one ? How many are onto? (ii) Find how many functions are there from B to A. How many of these are one to one ? How many are onto? 07 M
(Level [3], CO [3], PO [5])

OR

6 a. Let f and g be functions from R to R defined by $f(x) = ax + b$ and $g(x) = 1 - x + x^2$ If $(g \circ f)(x) = 9x^2 - 9x + 3$ determined a and b. 06 M
(Level [2], CO [3], PO [5])

b. If $f: A \to B$ and $g: B \to C$ are invertible functions then show that $g \circ f: A \to C$ is an invertible function and $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ 07 M
(Level [1], CO [3], PO [1])

c. Let A and B be two finite sets with $|A| = m$ and $|B| = n$ (i) Find how many functions are possible from A to B? (ii) If there are 2187 functions from A to B and $|B| = 3$ then what is $|A|$? 07 M
(Level [3], CO [3], PO [5])

UNIT – IV

7 a. Define subgraph, Regular graph and Complete bipartite graph with an example each. 06 M
(Level [1], CO [4], PO [1])

b. Show that K_5 is non-planar graph. 07 M
(Level [2], CO [4], PO [1])

c. Prove that a graph G is Eulerian if every vertex of G is of even degree. 07 M
(Level [2], CO [4], PO [5])

UNIT –V

8 a. Obtain the addition and multiplication table for finite field GF(11). 06 M
(Level [1], CO [5], PO [1])

b. State and prove Fermat's theorem. 07 M
(Level [2], CO [5], PO [1])

c. Solve $x \equiv 3 (\text{mod } 4)$, $x \equiv 4 (\text{mod } 7)$, $x \equiv 1 (\text{mod } 9)$ and $x \equiv 0 (\text{mod } 11)$ 07 M
(Level [2], CO [5], PO [5])

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MATCI41 / 16MATCI41

Fourth Semester B.E. Makeup Examination, June 2018

DISCRETE MATHEMATICAL STRUCTURES AND GRAPH THEORY / ENGINEERING MATHEMATICS - IV

Time: 3 Hours Max. Marks: 100

Instructions: 1. *Questions from unit IV and V are compulsory.*
2. *Answer any ONE Full question from each of other units.*

UNIT - I

1 a. Prove that, for any propositions p, q, r the compound proposition $\{p \rightarrow (q \rightarrow r)\} \rightarrow \{(p \rightarrow q) \rightarrow (p \rightarrow r)\}$ is a tautology. 06 M

(Level [1], CO [1], PO [1])

b. Define Existential and Universal quantifiers. Write down the following statement in symbolic form and obtain its negation. "All integers are not rational numbers and some rational numbers are not integers". 07 M

(Level [2], CO [1], PO [1])

c. Test whether the following argument is valid or not 07 M

$$\begin{array}{l} p \\ p \rightarrow q \\ s \vee r \\ r \rightarrow \neg q \\ \hline \therefore s \vee t \end{array}$$

(Level [3], CO [1], PO [5])

OR

2 a. Let p(x,y) be an open statement " x divides y" and the set of all integers be the universe. Find whether the following statements are true or false: (i) $\forall y, p(1, y)$ 06 M
(ii) $\forall y, \exists x, p(x, y)$ (iii) $\exists y, \forall x, p(x, y)$ (iv) $\forall x, \forall y, [p(x, y) \wedge p(y, x)] \rightarrow (x = y)$

(Level [1], CO [1], PO [1])

b. Prove the following logical equivalences without using truth table: 07 M
(i) $\{p \vee [p \wedge (p \vee q)]\} \Leftrightarrow p$ (ii) $[(p \vee q) \vee (\neg p \wedge \neg q \wedge r)] \Leftrightarrow (p \vee q \vee r)$

(Level [3], CO [1], PO [1])

c. Test the validity of the argument: 07 M
If I have talent and work hard then I will become successful in life
If I become successful in life then I will be happy
∴ If I will not be happy, then I did not work hard or I do not have talent.

(Level [2], CO [1], PO [5])

UNIT – II

3 a. If $A, B, C \subseteq Z \times Z$ with $A = \{(x, y) : 5x - 1\}$, $B = \{(x, y) : y = 6x\}$ and $C = \{(x, y) : 3x - y = -7\}$. 06 M
Find (i) $A \cap B$ (ii) $B \cap C$ (iii) $\overline{\overline{A} \cup \overline{C}}$.

(Level [2], CO [2], PO [1])

b. Let A={1,2,3,4,6} and R be a relation on A defined by aRb if and only if " a is a multiple of b". Represent the relation R as a matrix and draw its digraph. 07 M

(Level [2], CO [2], PO [1])

c. Let S={1,2,3} and P(S) be the power set of S. On P(S) define the relation R by XRY if and only if $X \subseteq Y$. Show that this relation R is a partial order on P(S). Draw its Hasse diagram. 07 M

(Level [3], CO [2], PO [5])

OR

4 a. Let A = {1,2,3,4,5,6,7,8,9,10,11,12} on this set define a relation R by $(x, y) \in R$ if and only if x-y is a multiple of 5. Verify that R is an equivalence relation on A. 06 M

(Level [1], CO [2], PO [1])

b. Let R be a relation on the set A = {1,2,3,4} defined by xRy if and only if " x divides y". Prove that (A , R) is a Poset. Draw its Hasse digram. 07 M

(Level [2], CO [2], PO [5])

c. For any non empty sets A, B, C prove the following 07 M

(i) $A\times(B\cup C)=(A\times B)\cup(A\times C)$ (ii) $(A\cup B)\times C=(A\times C)\cup(B\times C)$

(Level [3], CO [2], PO [1])

UNIT – III

5 a. Let A={1,2,3,4,5,6} and B={6,7,8,9,10}. If a function $f:A\to B$ defined by f={(1,7),(2,7),(3,8),(4,6),(5,9),(6,9)}. Determine $f^{-1}(6)$ and $f^{-1}(9)$. Also, if $B_1=\{7,8\}$ and $B_2=\{8,9,10\}$ find $f^{-1}(B_1)$, $f^{-1}(B_2)$. 06 M

(Level [2], CO [3], PO [1])

b. Suppose A and B are finite sets having the same number of elements and f is a function from A to B.Prove that f is one-to-one if and only if f is onto. 07 M

(Level [2], CO [3], PO [1])

c. Let A=B=R, the set of all real numbers and the function $f:A\to B$ and $g:A\to B$ be defined by $f(x)=2x^3-1,\forall x\in A$ and $g(y)=\left(\frac{y+1}{2}\right)^{1/3},\forall y\in B$. Show that f and g are inverses of each other. 07 M

(Level [3], CO [3], PO [5])

OR

6 a. There are six programmers who can assists eight executives. In how many ways can the executives be assisted so that each programmer assists atleast one executive? 06 M

(Level [2], CO [3], PO [5])

b. Let $f:A\to B$ be a function and C and D be arbitrary non-empty subsets of B then prove the following i) $f^{-1}(C\cup D)=f^{-1}(C)\cup f^{-1}(D)$ ii) $f^{-1}(\overline{C})=\overline{f^{-1}(C)}$ 07 M

(Level [1], CO [3], PO [1])

c. Determine the coefficient of x^{15} in $f(x)=(x^2+x^3+x^4+\ldots\ldots)^4$ 07 M

(Level [3], CO [3], PO [ ])

UNIT – IV

7 a. Define Hamilton path, Planar graph, Complete Bipartite graph with an example each. 06 M

(Level [1], CO [4], PO [1])

b. If G=(V,E) be a connected planar graph with $|V|=v,|E|=e$. Let r be the number of regions in the plane. Prove that $v-e+r=2$. 07 M

(Level [2], CO [4], PO [1])

c. Show that the following graphs are isomorphic 07 M

Fig. (a)

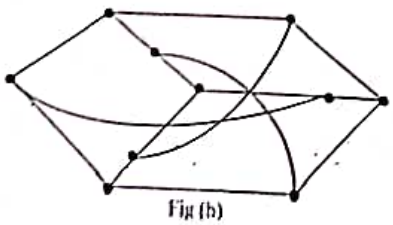

Fig (b)

(Level [2], CO [4], PO [5])

UNIT –V

8 a. Obtain addition and multiplication table for finte field GF(2^3). 06 M

(Level [1], CO [5], PO [1])

b. Find gcd[a(x), b(x)] for $a(x)=x^6+x^5+x^4+x^3+x^2+x+1$ and $b(x)=x^4+x^2+x+1$ 07 M

(Level [2], CO [5], PO [1])

c. State Chinese remainder theorem. Solve $x\equiv 0(\text{mod}3)$, $x\equiv 2(\text{mod}5)$ and $x\equiv 6(\text{mod}11)$ 07 M

(Level [2], CO [5], PO [5])