

PART A (4 * 10 = 40) Answer all the questions

Q. No	Questions	Marks
1.a)	Investigate the possibility of orphan and zombie process in process management.	4
1.b)	Trace the output of the following C Snippet <pre>#include <stdio.h> #include <unistd.h> int main() { if (fork()) { if (!fork()) { fork(); printf("1 "); } else { printf("2 "); } } else { printf("3 "); } printf("4 "); return 0; }</pre>	6

2. Identify and mention the salient properties of the following types of operating systems: 10
- a. Batch
 - b. Interactive
 - c. Time sharing
 - d. Real time
 - e. Network
 - f. Parallel
 - g. Distributed
 - h. Clustered
 - i. Handheld
- 3.a Mention the significance of all the three schedulers and their role in process management. 5
- 3.b Discuss the operating system structure that interconnects various components and melded into a kernel 5
4. Illustrate process transition from new state to terminate state with a neat state transition diagram 10

PART B (1 * 10 = 10) Answer all the questions

5. Design an appropriate scheduling policy that can suit to the following scenario. All the three process to be scheduled are generated at 0th time instant with first spell time spent on I/O for 2,4,6 units followed by second spell with cpu for 7,14,21 units and then followed by third spell with I/O for 1,2,3 units respectively by process P1,P2 and P3. The policy should address the convoy effect. Estimate the average (response time)RT, TAT, WT and CPU utilization percentage. 10

FART-A

Answer Any FOUR questions

(4 x 10 = 40)

1. a. Provide three programming examples in which multithreading provides better performance than a single-threaded solution
- b. Differentiate between user-level threads and kernel-level threads? Under what circumstances is one type better than the other?
2. Consider the set of 5 processes whose arrival time and burst time are given below. If the CPU scheduling policy is priority pre-emptive, draw the gnat chart, calculate the average waiting time, and average turnaround time. (Higher number represents higher priority)

Process Id	Arrival time	Burst time	Priority
P1	0	4	2
P2	1	3	3
P3	2	1	4
P4	3	5	5
P5	4	2	5

3. a. A counting semaphore S is initialized to 10. Then, 6 P (wait) operations and 4 V (signal) operations are performed on S. What is the final value of S? (2)
- b. Show that, if the wait() and signal() semaphore operations are not executed atomically, then mutual exclusion may be violated. (6)
- c. Differentiate between Binary semaphore and counting semaphore (2)

a. How do we prevent a race condition in producer-consumer code? Suggest and explain any two mechanisms. (5)

b. Develop a program segment for Producer and Consumer for the following scenario.

Assume that the buffer size is fixed. A producer can create something and add it to the buffer. A consumer has the option to select and consume stuff. We must make sure that when a producer adds something to the buffer, the consumer doesn't consume anything at the same moment. The buffer is the critical section. (5)

5. List the cycles exit in the following RAGs (both in Fig1 & 2). In which RAG deadlock occurs and deadlock does not occur? Why? Justify your answer.

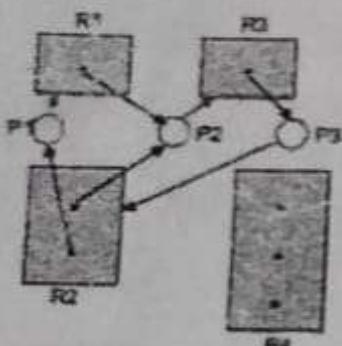


Fig.1

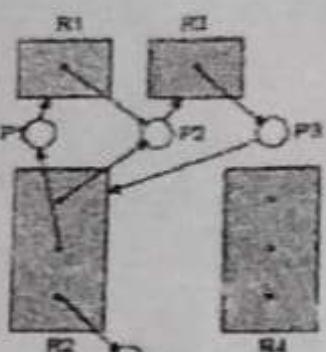


Fig.2

Part - B

Answer the Following Question

(1 x 10 = 10)

6. Many CPU-scheduling algorithms are parameterized. For example, the RR algorithm requires a parameter to indicate the time slice. Multilevel feedback queues require parameters to define the number of queues, the scheduling algorithms for each queue, the criteria used to move processes between queues, and so on.

These algorithms are thus really sets of algorithms (for example, the set of RR algorithms for all time slices, and so on). One set of algorithms may include another (for example, the FCFS algorithm is the RR algorithm with an infinite time quantum). What (if any) relation holds between the following pairs of algorithm sets? Justify your answer.

- a. Priority and SJF
- b. Multilevel feedback queues and FCFS
- c. Priority and FCFS
- d. RR and SJF



PART A

4 X 10 = 40

Answer any FOUR questions

1. Consider a Priority based RR scheduling algorithm in which processes are chosen as per the priority and then executed for a fixed time quantum (treat time quantum as 2). When two processes with same priority value arrive, then the process with the shortest remaining time is chosen. Compute the TT, WT and CPU idle time for the given set of processes. Note that currently running process gets prompted only when it time expires not when a high priority process arrives. Lowest value implies highest priority.

Plid	Arrival time	Burst time	Priority
P1	2	4	2
P2	3	5	1
P3	4	2	2
P4	6	3	3

2. Consider processes in question number 1 with their priorities. From the following data, find out whether the processes are caught in a deadlock or not. If not, identify a safe sequence which also fulfils the priority requirement by completing the processes as per their priority order (ignore the arrival times and assume that all the processes arrive at time 0). If such a sequence exist then the output should be "safe and priority enforced", else the output should be "safe but priority compromised". Show the step by step execution of processes. Total number resources present in the system: 5 pen drives, 3 printers, 4 scanners, 5 hard disks. Following are the allocations made so far:

PID	Pen drive	Printer	Scanner	Hard disk
P1	2	0	1	1
P2	0	1	0	0
P3	1	0	1	1
P4	1	1	0	1

Following are the pending requirements of processes:

Process	Pen drive	Printer	Scanner	Hard disk
P1	1	1	0	0
P2	0	1	1	2
P3	2	1	0	0
P4	0	0	1	0

5. Consider a server with a database in which some clients upload their files and some clients download those files. When files are downloaded they are removed from the database. Enforce mutual exclusion on the database access. Ensure that the clients are not allowed to download when database is empty. When there is no space in database, clients cannot upload. There is another type of client called supervisor who neither uploads nor downloads but just monitors the database. No need to enforce mutual exclusion among the supervisor processes. Develop an algorithm that enforces the given conditions through semaphores. Explain your algorithm to show that it satisfies all the conditions.

4. In a Disk scheduling strategy, disk Read requests favored over Write requests. So all the read requests are accomplished before taking any write requests. Implement SSTF algorithm that is combined with the above mentioned strategy such that the shortest seek time first read requests are facilitated before completing the write requests. Similarly compute the head movements under Scan algorithm. The initial head position is 57. There are 100 tracks on the disk.

R	W	W	R	W	R	R	W	R	R
45	21	67	90	4	50	89	52	61	87

R-Read, W-Write

5. Illustrate the process state transitions with a process state model diagram. List out the various causes of each possible process transitions. Write the program for the creation of child process using fork and point out the different process states that the program will go through during its execution.

Part B

Answer the following question

1 X 10 = 10

6. a). Discuss the file allocation methods with their merits and demerits (4)
b). i). Imagine a system with the logical memory of 64 MB. The size of each page is 4 KB. Assume that the size of physical memory is 10 MB. Compute the size of logical address (in bits) and in that the size of page number and size of offset. (2)
ii). Assume that there are three frames in memory. Calculate the number of page faults under Optimal and LRU page replacement algorithms. Sequence of page references: 1, 2, 3, 1, 4, 3, 5, 6, 2, 7, 4, 8, 1, 9. (4)



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THANJAVUR KENIAKONAM CHENNAI

School of Computing

First CIA Exam – Feb 2023

Course Code: CSE314R01&CSE215R01

Course Name: Software Engineering

Practices & Software Engineering

Duration: 90 mins Max. Marks: 50

PART A(10*2=20)

Answer ALL

1. State different roles of software with suitable example.
2. We agree software industry has become a dominant factor in the economies of the industrialized world. Software industries have teams of software specialists, each focusing on one part of the technology required to deliver a complex application and have replaced the lone programmer of an earlier era. Yet, there were some questions asked of the lone programmer, are asked, even now with the emergence of modern computer-based system, that led to the adoption of software engineering practice. List any of the four questions that set the stage for the adoption of software engineering practice.
3. As a software engineer, having understood the software problem, you are heading towards planning the solution for the software problem. What necessary things will you analyze to plan the solution?
4. Arun, a business analyst, is assigned in a complex software project ‘SpaceY’. The project involves many stakeholders, each with the different set of requirements. How does he conduct the communication activity for this project?
5. Identify the uses of stage and task pattern types of process patterns with suitable example.
6. Match the following:

ISO	-	IEC 15504
CBA IPI	-	SEI CMMI
SCAMPI	-	9001:2000
SPICE	-	SEI CMM
7. ‘SafeCar’ Software is planned to be built using prototyping/spiral/concurrent process models. Recall any two common limitations of these process models in brief.
8. Which software process model is derived from an activity that occurs during the rugby match? Illustrate the logical connection between the activity and the process model.
9. A function in ‘AirAmbulance’ software is validated against fourteen system characteristics-based questions to compute function points and their sum is 75. Calculate the value adjustment factor.
10. Assume the estimated FPs for an AutoCAD software is 486. A review of historical data indicates that the organizational average productivity for this

type of systems is 50 FP/pm. Labour rate is 8000 USD/pm. Estimate the cost per FP, total project cost and effort (in person-months).

PART B (3*10=30)

Answer ALL

11. Sally is in-charge for conducting the 'Elicitation' action for a larger, more complex project 'ChatGPT' an AI based software. Suggest Sally the best set of task sets, that would be required to gather the requirements of the software.
12. 'HealthTracker' is a software application that serves to track various aspects of daily life contributing to well-being such as physical activity, diet, and sleep. The application can be installed on smart phones. The dashboard is the main display of the application. The table shows on one page, a general overview of the most recent data saved. In addition, it provides direct access to each feature. Its composition and layout are customizable. Some features of the software are tracked by phone sensors and some features are tracked by user input. The main features of the HealthTracker include: pedometer, dietary monitoring, sleep tracker and heart rate measurement. The initial requirement of the software is identified as Pedometer, and there is a compelling need to provide this feature to users quickly and the software is then planned to refine and expand the other features such as dietary monitoring, sleep tracker and heart rate measurement in later software releases. Pedometer is a step counting feature integrated with the software. The default goal is to reach 10,000 steps per day. The number is recommended by World Health Organization. The app calculates other data such as distance travelled, the number of calories burnt and the number of steps taken at a good pace. According to the application information, a good rhythm is obtained when a rate of at least 100 steps per minute is maintained for ten minutes. At the visual level, we can use the data with different graphics: On a 24-hour day with a histogram showing activity (number of steps) in 24-minute increments (60 slices of 24 minutes in one day). Daily, weekly and monthly trends showing the average number of daily steps taken. Identify the suitable model to implement the software. Justify the reason. Explain the process model in detail.
13. The subsystems of the 'HealthTracker' software and the expected LOC for each of the subsystems is shown in a table given below. The historical data indicates that average productivity of commercial software of this type is 1200 LOC/pm. Burdened labour rate is \$2100/pm. Based on the LOC and the historical productivity of the organization, compute efforts in person/months. Compare the Effort in person-months for the same software using Software Equation and Putnam and Myer's. (5+5)

Subsystems	Estimated LOC
Pedometer	18000
Dietary monitoring	15500
Sleep tracker	12300
Heart rate measurement	7000



School of Computing
Second CIA Exam – March 2023
Course Code: CSE215R01
Course Name: Software Engineering
Duration: 90 mins Max.Marks:50

PART A(10*2=20)

Answer ALL

1. Mohan works as a business analyst, wants to learn the goals and benefits of the software project ‘HealthTracker’. What are the specific type of questions Mohan would ask the stakeholders to learn them?
2. Identify any two lists of objects, services, constraints and performance criterions for the project ‘PayTM’.
3. Neatly sketch the process, that depicts the identification, analysis and specification of common requirements from a specific application typically for reuse on multiple projects within the same application domain.
4. The Knowledge Resource Centre (KRC) of a university, allows students and faculties to search for an e-book through online public access catalogue. The user is validated with their mail id and password. If the user id/password is incorrect for three consecutive attempts, the account would be locked. Upon successful validation of the user, the user can choose ‘search a book’ from major functions of the software. The user can then search for a book by its name/authors, the system would search the book in the database and returns the location of the book with its shelf id and row id if the book is available. The system would recommend similar type of books, if the book is unavailable. Represent the flow of activities described by the use case with a suitable diagram by indicating the actors involved in the use case.
5. Arun is a review leader, associates himself in the preparation of requirement modeling of a software project. As part of the requirement model, communication team members have drawn Class-Responsibility-Collaborator (CRC) diagram of the software, as the project is to be implemented using Object-oriented programming. How do the stakeholders and Arun review the correctness of the CRC model?
6. In operating system, process is an active entity. Process management is a critical component of any operating system. Process management involves various tasks like creation, scheduling, termination of processes and deadlock. If you denote the process management as an analysis class, what would be the different states of a process.
7. Compute the LCOM value for the following class snippet:

```
class Area{float r,b,h,a,l,w; public: void circle(){r=5;cout<<3.14*r*r;}void triangle(){b=10;h=5;cout<<0.5*b*h;}void square(){a=3;cout<<a*a;}void rectangle(){l=2;w=4;cout<<l*w;}void ellipse(){a=6; b=7; cout<<3.14*a*b;}};
```

8. Priya creates a gaming application 'Roblox', an immersive interactive application. List the characteristics/nature of this type of gaming software, while you consider drawing the architecture diagram of the software.
9. Draw the Architectural Contextual Diagram of a software 'SafeCar'.
10. How would you elaborate the design of a traditional component?

PART B (3*10=30)

Answer any THREE

The software 'CodeMantra' is an AI (Artificial Intelligence) assisted assessment platform with online remote proctoring. The software provides two-factor authentication-based access, organization role-based access control, encryption of data over wire and encryption of data at rest. The software offers comprehensive composite recording and playback of all aspects of online tests, including multiple cameras, screen, timer, navigation, activity, locations, answers and multiple audio streams. Though the software could assist teacher to schedule Classes/ Google Meetings, manage courses and conduct labs, there is an urgent need to implement part of the software for conducting semester exam online. The teacher post questions in the portal and schedule for the exam. During proctoring, the teacher could, monitor students through video and audio streaming, Block/unblock students, mute/unmute microphone, write observations, view test summary, extend exam time and send personal message to Students. If a student misbehaves, the underlying AI algorithm will send a notification to the teacher. On the other hand, student may login with two mobile devices. The first device is to take test and second device is to upload answers. The software ensures whether the student's camera, microphone and speaker of the first device are working properly or not. Once the devices are verified and student's environment is checked, the question will be displayed to the student. The student may navigate between questions using the 'proceed button'. When the student wants to upload answer, they should take the screen shot of the answer from secondary device's camera and press submit button. The answer scripts are evaluated by the teacher and the test results are released in the portal itself. With this detailed product request, you are requested to do the following:

11. Prepare use case template for 'ConductMeeting' using google meet.
12. Analyze the potential classes of the software and neatly draw the analysis class diagram.
13. Write the procedure to conduct the component-level design in detail.
14. Elaborate the analysis classes you obtained in Q12. into an OO component level design by adhering the procedure you have written in Q13.



School of Computing
Third CIA Exam – May 2023
Course Code: CSE215R01
Course Name: Software Engineering
Duration: 90 mins Max.Marks:50

PART A($10 \times 2 = 20$)

Answer ALL

1. How does the nature of web applications changed and evolved over time?
2. How do you divide the crosscutting concerns of functional and non-functional properties of the software in aspect-oriented software development?
3. List the key traits that must exist among people on an agile team and the team itself.
4. Neatly sketch the various types of requirement models, the software team builds in communication activity.
5. Recall the characteristics, a class, should satisfy to be designated as a potential analysis class.
6. Reliability is one of the quality attributes that acts as a target for all software design. How would the software team evaluate the reliability of a software?
7. A software testing team is assigned to test a module developed in conventional programming. What types test cases would they be writing to conduct unit testing of the module?
8. Name the testing that tests 'daily builds' of a software product and define its uses.
9. Illustrate the debugging techniques with suitable example.
10. How would you ensure the correctness and consistency of object-oriented models?

PART B ($2 \times 10 = 20$)

Answer any TWO

11. Neatly sketch the template for software requirement specification document.
12. Differentiate activity diagram and swimlane activity diagram with suitable example.
13. Illustrate the different types of architectural styles with suitable example.

PART C ($1 \times 10 = 10$)

Answer ALL

14. Write C++ program to check, whether the given number is prime number or not, construct flow graph, identify the independent paths and derive the test cases to conduct independent path analysis testing of the program

PART-A

- I. Answer the following questions $10 \times 2 = 20$ Marks
1. Mention your strength that helps to develop social transaction
 2. Write about an opportunity you utilized to bring out your skills
 3. Expand VUCA and VUCA 2.0
 4. Enumerate two benefits of VUCA 2.0
 5. List out five steps of Maslows Hierarchy of needs
 6. Name two steps to strengthen your self actualization
 7. Differentiate Global and Glocal value systems with examples
 8. Give two examples for translocational impact in the business world
 9. Explain Role of Rivers in perspective of Culture and Values.
 10. Provide an example to prove Effective Cross Cultural Communication

PART-B

- II. Answer the following questions $3 \times 10 = 30$
- Marks 11. Analyse a SWOT to achieve your goals. Identify your strengths and weaknesses, leverage opportunities and counteract the threats/Challenges in the present Business Era.
12. Elevate the thoughts of VUCA into VUGA 2.0 in the perspective of Higher Education Abroad.
13. Discuss on the trajectory of rivers from the cultural heritage to the commercial profit in the present digital scenario.



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II CSBS -Semester IV- CIA I – Feb 2023
ENG212Business Communication & Value Science III

Duration: 90 Mts.

Max. Marks: 50

PART-A

I. Answer the following questions **10x2=20 Marks**

1. List out the skills to develop Effective Communication
2. Write about an opportunity you utilized to express your strength and hide your weakness
3. Expand VUCA and VUCA 2.0
4. Give two applications of artificial intelligence.
5. Mention five steps of Maslow's Hierarchy of motivation
6. Name two strategies to strengthen customer relationship in business ambience
7. Differentiate Global and Glocal value systems with examples
8. Give two examples for translocational impact in the business world
9. Define SWOT in business system.
10. Enumerate the extrinsic and intrinsic employee experience factors to motivate them

PART -B

II. Answer the following questions **3x10=30 Marks**

11. Analyse a SWOT to achieve your goals . Identify your strengths and weaknesses, leverage opportunities and counteract the threats/Challenges in the Business Era.
12. Elevate the thoughts of VUCA to VUCA 2.0 in the perspective of startups.
13. Discuss on five uses of artificial intelligence in everyday life - their advantages and limitations.



SASTRA Deemed University
II CSBS -Semester IV- CIA II- May 2022
ENG212Business Communication & Value Science III

Duration: 90 Mts.

Max. Marks: 50

PART-A

- I. Answer the following questions 10x2=20 Marks**
1. Define Artificial Intelligence and explain its importance
 2. Mention four types of Artificial Intelligence
 3. List out two types of Verbal Communication with an example each.
 4. Name any two factors of non-verbal communication
 5. State two merits of street view application
 6. Give two limitations of oral communication
 7. Enumerate the role of science in nation building
 8. Write any two revolutions in science during post independence era.
 9. Discuss a situation where you have communicated more with the machines than the human beings
 10. Describe an imaginary gadget helpful for your business.

PART -B

- II. Answer the following questions 3x10=30 Marks**
11. Science is the corner stone in the development of nation- Elucidate
 12. Produce a user manual for any gadget, you have recently purchased. Include Logo, Caption, safety guidelines, functions and capabilities of the product, variants, instructions for installation, use & troubleshooting and warranty statement
 13. Draft a Feasibility Report of starting an Organic Retail Outlet in your locality. Your outlet will deal with organic groceries, A2 milk, cereals, fruits and vegetables. Your report should contain- terms of reference, work done, findings, recommendations and conclusion.



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**SASTRA Deemed to be University
Second CIA Exam – March 2023**

Course Code: ENG212

Course Name: Business Communication &
Value Science

Duration: 90 mins

Max.Marks:50

PART-A(10x2=20)

Answer the following questions

1. Define Culture shock
2. Give two tips to overcome the culture shock
3. List out two transport system in the rivers of India
4. Mention two ways the rivers are used for food production
5. State the trajectory of rivers used for the commercial profit
6. Explain Role of Rivers in perspective of Culture and Values.
7. Enumerate the role of science in nation building
8. Write any two revolutions in science during post-independence era.
9. Discuss the situations where you have communicated more with thema chines than the human beings.
10. Describe an imaginary gadget helpful for your business.

PART-B (3x10=30)

Answer the following questions

11. Science is the cornerstone in the development of nation - Elucidate
12. Produce a user manual for any gadget, you have recently purchased! Include Logo, Caption, safety guidelines, functions and capabilities of the product, variants, instructions for installation, use & troubleshooting and warranty statement
13. Draft a Feasibility Report to start an Eco-friendly products manufacturing unit. Eco-friendly products are not harmful to the environment these products are made from organic and all-natural ingredients. They also come in recyclable compostable or biodegradable packaging. Your report should contain- terms of reference, work done, findings, recommendations and conclusion.



**SASTRA Deemed to be University
III CIA Exam – May 2023**

Course Code: ENG212

Course Name: Business Communication &
Value Science

Duration: 90 mins

Max.Marks:50

PART-A

(2 x 10 = 20)

Answer the following questions

1. Differentiate Cultural Pluralism and Multiculturalism.
2. Draft a 100-word Bio-sketch of you, as an engineer. Strike a balance in the tone of your writing – professional yet friendly. Include significant and impressive points about your skills, family, native place, and ambition. Be descriptive and use third person narrative.

PART-B

(2 x 15 = 30)

Answer the following questions

3. Design your college in the year 2040 - include infrastructure building and faculty, library, playground and sports, syllabus and mode of teaching, classrooms and labs. Use drawings if necessary – Elucidate.
4. Discuss the basic elements of cross-cultural communication. List out obstacles to a successful cross-cultural communication and 7 tips for improving cross-cultural communication at the workplace with examples of effective cross-cultural communication



SASTRA

School of Computing
Class: II year B.Tech CSBS

CIA Test -i

April 2022

Course Code: MGT 207

Course Name: Introduction to Innovation, IP Management & Entrepreneurship.

Duration: 90 minutes

Max Marks: 50

Part A

Answer all questions

$10^*2 = 20$ marks

1. Define innovation with an example.
2. Illustrate the importance of innovation through its outcomes
3. Summarize the characteristics of innovation.
4. Describe the phases of innovation.
5. Interpret the innovation space in brief.
6. Explain the dimensions of innovation
7. Identify the role of a manager in recognising innovation in management practices
8. Discuss the categories of innovation strategy in marketing, distribution of products.
9. Define creativity.
10. Recall the term "Knowledge markets"

Part B

Answer all questions

$3^*10 = 30$ marks

11. Compare and contrast different types of innovation with valid examples
12. Categorize and synthesise the knowledge generation process, with mention of its types.
13. Sketch the components of an innovative organisation in detail.

SOC
III ME ⑩



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GOVERNMENT OF TAMIL NADU PARTNERSHIP DEEWA SASTRA

School of Management
II CIA Test - MAY 2022
Yr. Prog: II B.TECH CSBS
Course Code: MGT 207
Course Name: Introduction To Innovation, IP
Management & Entrepreneurship
Duration: 90 minutes

Max Marks: 50

Part A

Answer all questions

$10 \times 2 = 20$ marks

1. Explain the role of SWOT analysis.
2. Brief about questionnaire with a suitable example
3. Depict the role of focus group in the process of innovation
4. Outline the concept of need analysis
5. Differentiate internal and external desk research
6. Mention the principles of effectuation process
7. Define design thinking
8. Define technology watch
9. State the role of lean start up process for an entrepreneur
10. Discuss about the process of seeking opportunity from the environment.

Part B

Answer all questions

Screening
 $3 \times 10 = 30$ marks

11. Compare and contrast open and collaborative innovation with valid examples
12. Explain the different types of market entry strategy available for an entrepreneur to venture abroad
13. "The main tenet of design thinking is empathy for the people you're trying to design for". Discuss



**School of Computing
Second CIA Exam – March 2023**
Course Code: MGT 207
Course Name: Introduction to
Innovation, Entrepreneurship and IP
Management
Duration: 90 minutes Max Marks: 50

PART A [10 * 2 = 20 marks]

Answer all the questions

- 1) Mention the three levels at which the innovation occurs.
- 2) Illustrate the task of finding an opportunity in the stages of innovation
- 3) Innovation is not an isolated process but it is determined by the environment. Depict it through a befitting diagram.
- 4) List the process of new product development
- 5) Define project management and why is it important?
- 6) Outline the process of design thinking.
- 7) Sketch out the stages of business
- 8) Differentiate strategic alliance and joint venture with apt examples.
- 9) Explain the types of user innovation
- 10) Brief on the challenges in open innovation and the strategies that can be employed for open innovation.

PART B(Answers all questions)

(3 * 10=30 Marks)

- 11) Sketch out the various methods of idea creation that can be used with illustrative examples
- 12) Explain the different types of market entry strategy available for an entrepreneur to venture abroad.
- 13) Being an entrepreneur, elucidate the method that can be employed for taking valid and logical decisions.

School of Management
III CIA Test – JUNE 2022
Yr. Prog: II B.TECH CSBS
Course Code: MGT 207

Course Name: Introduction To Innovation, IP Management & Entrepreneurship

Duration: 90 minutes Max Marks: 50

Answer all the questions

Part - A : $5 \times 2 = 10$

1. How can creativity be enhanced?
2. Discuss the different creativity thinking styles.
3. Discuss about the process of seeking opportunity from the environment
4. Enlist about the remedies available against the infringement of the copyright.
5. What do you mean by Geographic indications?

Part - B : $2 \times 15 = 30$ (2 out of 3 covering all units)

6. Explain briefly about effectuation process.
7. Synthesize how an industrial design application gets accepted through the various processes. Explain about the steps briefly
8. "A patent is not a license to make money. It is a license to prevent others from making money." Discuss the patent procedure in detail.

Part - C $1 \times 10 = 10$ marks

9. Ratio analysis is a quantitative method of gaining insight into a company's liquidity, operational efficiency, and profitability by studying its financial statements such as the balance sheet and income statement. Do you agree? Demonstrate it for a new firm with illustration of ratio analysis tools.



PART A[10 * 2 = 20 marks]

Answer all the questions

- 1) Mention the 4 P's of innovation.
- 2) Illustrate the dimensions of innovation, with a diagram.
- 3) List the types of knowledge.
- 4) Discuss the determinants of organizational creativity.
- 5) Outline the fishbone diagram with an example.
- 6) Sketch out the process of effectuation.
- 7) Differentiate turnkey operations and franchising with apt examples.
- 8) Define break even analysis
- 9) List out a few geographical indications in India
- 10) Distinguish between industrial design and trademark.

PART B(Answer all questions)(2 * 10=20 Marks)

11. a. Discuss the various techniques used to for evaluating the projects.

OR

- b. Sketch out the concept of copyright infringement and remedies for it.
- 12.a. Explain the process of design thinking elaborately.

C.R

- b. Elucidate the patent filling procedure in detail.

PART C (Compulsory Question) (1*10 =marks)

13. Vignesh, an energetic management graduate wants to become an entrepreneur and discusses a new business idea with you. He has plans to start a Two Wheeler Taxi Service in Chennai and finalized the name of the venture as "Comfort Ride". His business idea is to offer quick travel solutions for short distances through motorcycles and scooters and wants to position his service as an immediate and affordable transportation mode to travel to their Office/Home from busy areas. The fares for the trip will be cheaper than the TATA Mini Van services. Discuss a). Whether the business idea is feasible? b. What are the factors that have to be looked into to firm up the business idea?



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School of Computing

First CIA Exam - Sept 2022



Course Code: CSE318

Course Name: Algorithm Design Strategies
& Analysis

Duration: 90 minutes

Max Marks: 50

PART A

Answer all the questions

$10 \times 2 = 20$ Marks

1. List out any six algorithm design strategies.
2. Solve the following recurrence using Master theorem.

$$T(n) = 2T(n/4) + n$$

Sol 408

ADSA 15

3. Define Big-Omega (Ω) notation.
4. Find the order of growth of the following code.

```
function(int n)
{
    if (n==1)
        return;
    for (int i=1; i<=n; i++)
        for (int j=1; j<=n; j++)
            {
                printf("*");
                break;
            }
}
```

5. Compare Divide & Conquer and Dynamic Programming approach in solving problems.
6. Find the recurrence for the following algorithm.

Algorithm: Fibonacci(n)

```
If n=1 then
    Return 0
Else If n=2 then
    Return 1
Else
    Return Fibonacci(n-1)+ Fibonacci(n-2)
End If
End Fibonacci
```

7. Draw the tree for the following recurrence and find the height of the tree.

$$T(n) = 3T(n/4) + 1 \quad \text{if } n>1$$

$$T(n) = \Theta(1) \quad \text{if } n=1$$

8. Design an algorithm to find the sum of elements in an array $A[1..n]$ by using divide and conquer approach.
9. Apply Insertion sort algorithm to sort the following list of elements.

[8, 5, 9, 6, 2, 4]

10. Mention time complexity for Insertion sort and Merge sort algorithms for the following input cases. (i) For Ordered Elements (ii) For Reverse Ordered Elements (iii) For Unordered Elements

PART B

Answer all the questions

3 x 10 = 30 Marks

11. The famous Indian cricketer Mr. X's year wise ODI batting average (Runs per Match) is given below.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Avg.	33.6	41.8	41.5	46.5	56.4	37.0	38.4	42.0	32.7	17.4	0.0	44.3

Design an efficient algorithm by using divide and conquer approach to find the period during which the player was in peak i.e., the period during which he maintained his consistency in batting. By tracing the algorithm, find Mr. X's peak period.

12. Consider a modification of the rod-cutting problem in which, in addition to a price p_i , for each rod, each cut incurs a fixed cost of c . The revenue associated with a solution is now the sum of the prices of the pieces minus the costs of making the cuts. Give a dynamic programming algorithm to solve this modified problem. The algorithm should return the maximum revenue. Using this algorithm, find the maximum revenue for the 5-inch rod with the following price list and the fixed cut cost of Rs.5 per cut.

Length	1	2	3	4	5
Price (Rs.)	10	24	30	40	50

13. (a) There are ' n ' numbers of identical coins. Among them, one is fake coin. The fake coin is lighter than the genuine coin. You will be given a balance scale for weighing coins. Design an algorithm using Divide and Conquer strategy to identify the fake coin which should run on $O(\lg n)$ complexity. Find the numbers of weighing by tracing the algorithm for $n=53$

(5 Marks)

- (a) Using recursion tree to determine a good asymptotic upper bound on following recurrences. *(5 Marks)*

$$T(n) = 2T(n/5) + n \quad \text{if } n > 1$$

$$T(n) = \Theta(1) \quad \text{if } n = 1$$



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School of Computing

First CIA Exam – Feb 2023

Course Code: CSE318

Course Name: Algorithm Design Strategies
& Analysis

Duration: 90 minutes

Max Marks: 50

PART A

Answer all the questions

10 x 2 = 20 Marks

1. Order the following functions by growth rate:

$N \log^2 N, N^2 \log N, N, N^2, N^3, 2^N, N \log N, N!, \log N, N^{1/2}$.

2. Solve the following recurrence using Master theorem.

$$T(n) = 8T(n/2) + \Theta(n^2)$$

3. Define Big-Oh notation.

4. Find the order of growth of the following code.

```
function(int n) {
    for (int i=1; i<=n; i++)
        for (int j=i; j<=n; j++) {
            if(i==j)
                continue;
            else
                break;
        }
}
```

5. Compare Divide & Conquer and Dynamic Programming approach in solving problems.

6. Find the order of growth of the following sum.

$$\sum_{i=0}^{n-1} (i^2 + 1)^2$$

7. Find the mid-crossing sub-array for the following list of elements A[0..13], for the range, low=7, high=13 and mid=10.

{3,-2,4,1,-7,5,8,-1,3,-4,6,-1,9,3}

8. Draw the recursion tree for the following recurrence and find the height of the tree.

$$T(n) = T(n-1) + T(n-2) + 1 \quad \text{if } n>2$$

$$T(n) = \Theta(1) \quad \text{if } n=1 \text{ or } n=2.$$

9. Apply Merge algorithm to merge two sorted list for the following list of elements for the ranges low=0, mid=4 and high=9.
[19, 28, 40, 56, 61, 17, 47, 59, 78, 89]
10. Mention time complexity for Insertion sort and Merge sort algorithms for the following input cases. (i) For Ordered Elements (ii) For Reverse Ordered Elements (iii) For Unordered Elements

PART B

Answer all the questions

$3 \times 10 = 30$ Marks

11. Illustrate the dynamic programming algorithm to find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is **<6, 5, 7, 3, 8>**.
12. Consider a modification of the rod-cutting problem in which, in addition to a price p_i , for each rod, each cut incurs a fixed cost of c . The revenue associated with a solution is now the sum of the prices of the pieces minus the costs of making the cuts. Give a dynamic programming algorithm to solve this modified problem. The algorithm should return the maximum revenue. Using this algorithm, find the maximum revenue for the 5-inch rod with the following price list and the fixed cut cost of Rs.5 per cut.

Length	1	2	3	4	5
Price (Rs.)	10	24	30	40	50

13. (a) Design an algorithm for searching a element from a list of unordered elements by applying divide & conquer approach which runs on $O(n)$ time complexity. Analyze the algorithm and prove that the time complexity is $O(n)$.

(5 Marks)

- (b) Using iterative method, determine a good asymptotic upper bound on following recurrence.

(5 Marks)

$$T(n) = 7T(n/2) + n \quad \text{if } n > 1$$

$$T(n) = \Theta(1) \quad \text{if } n = 1$$



PART A

Answer all the questions

10 x 2 = 20 Marks

1. Compare Dynamic Programming approach and Greedy approach in solving problems.
2. What is Minimum Spanning Tree of a graph?
3. Predict the algorithm design strategy used in solving following problems. (a) Fractional Knapsack Problem (b) 0/1 Knapsack Problem (c) Optimal Binary Search Tree (d) Job Sequencing Problem.
4. What is optimal binary search tree?
5. Describe Job Sequencing Problem.
6. Mention the maximum numbers of unique binary search trees can be generated for a given number of elements 'n'. $2^{n(n-1)}$
7. Define Hamiltonian cycle. State travelling salesperson problem.
8. What is optimization problem? Which algorithm design strategy is used mostly for solving optimization problem?
9. Give an example for solving TSP problem in brute-force approach.
10. Differentiate between strongly connected and weakly connected graphs. Give examples.

PART B

Answer any three questions

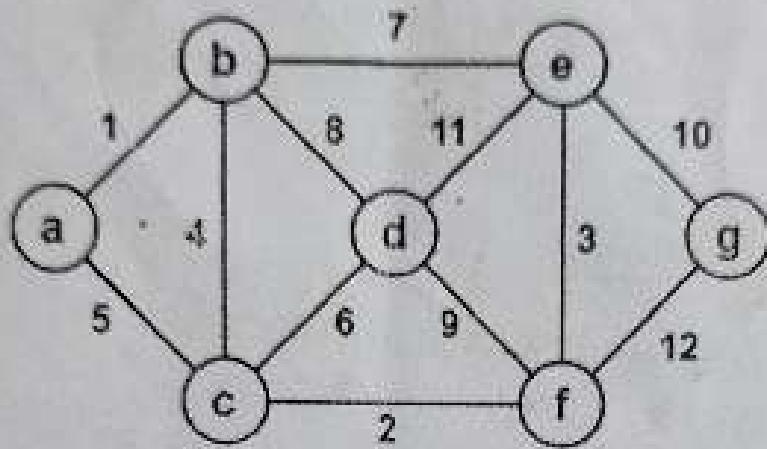
3 x 10 = 30 Marks

11. Using dynamic programming approach, compute $w(i,j)$, $r(i,j)$, and $c(i,j)$, $0 \leq i < j \leq 4$, for the identifier set $(a1, a2, a3, a4) = (\text{cout}, \text{float}, \text{if}, \text{while})$ with following probabilities.

$$p(1)=1, \quad p(2)=4, \quad p(3)=2, \quad p(4)=1, \\ q(0)=4, \quad q(1)=2, \quad q(2)=4, \quad q(3)=1 \& \quad q(4)=1.$$

Using the $r(i,j)$'s, construct the optimal binary search tree.

12. Find the minimum spanning tree for the following graph by tracing Prim's algorithm.



13. Describe 0/1 and fractional knapsack problems. Using greedy strategy, solve the following fractional knapsack problem.

Bag Capacity: $W = 15 \text{ Kg}$

No. of Items: $n = 7$

Items Weight: $w[1..7] = \{2, 3, 5, 7, 1, 4, 1\}$

Items Profit: $p[1..7] = \{10, 5, 15, 7, 6, 18, 3\}$

14. Let $X = \text{"aabaaababaa"}$ and $Y = \text{"babaaabab"}$. Find minimum cost edit sequence that transforms X into Y using dynamic programming algorithm strategy.



SASTRA

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School of Computing

Second CIA Exam – March 2023

Course Code: CSE318

Course Name: Algorithm Design

Strategies & Analysis

Duration: 90 minutes

Max Marks: 50

PART A

Answer all the questions

$10 \times 2 = 20$ Marks

1. Distinguish between Dynamic Programming approach and Greedy approach in solving problems.
2. Define the cost of searching in binary search tree. Give example.
3. Mention the time complexity and space complexity for the following problems. (a) 0/1 Knapsack Problem Using Dynamic Programming Approach (b) Optimal Binary Search Tree Using Dynamic Programming Approach.
4. In dynamic programming approach of string editing problem, what is the condition used in filling the cell $m[i, j]$? Give example.
5. Give the maximum numbers of unique binary search trees can be generated for a given number of elements 'n'.
6. What is Directed Acyclic Graph? Give example.
7. What is optimization problem? Which algorithm design strategy is used mostly for solving optimization problem?
8. Predict the algorithm design strategy used in the following algorithms. (a) Prim's Algorithm (b) Kruskal's Algorithm (c) Job Sequencing Problem (d) Fractional Knapsack Problem
9. Write the application(s) of Breadth First Traversal and Depth First Traversal of graph.
10. Describe 0/1 and fractional knapsack problems.

PART B

Answer any three questions

$3 \times 10 = 30$ Marks

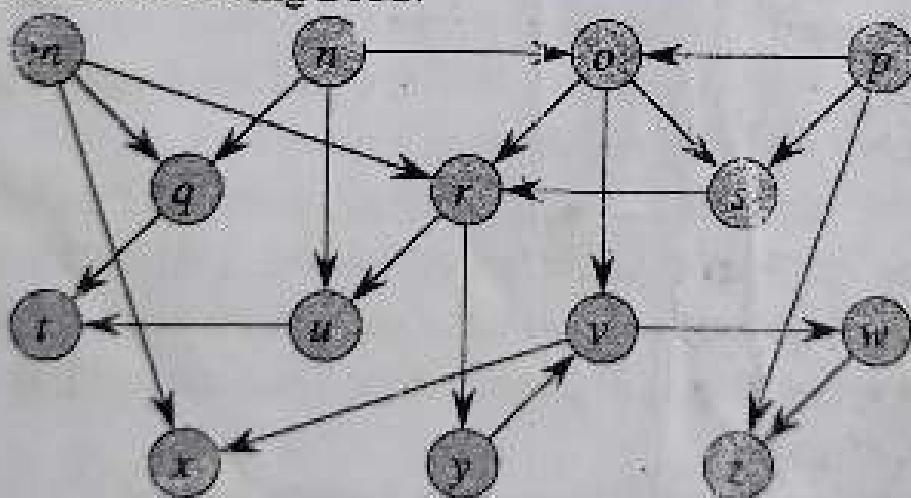
11. Design an algorithm using greedy approach to find a sequence of jobs, which is completed within their deadlines and gives maximum profit. Illustrate the algorithm for the following input.

$n=8$	Jobs With Profit & Deadlines							
Jobs	1	2	3	4	5	6	7	8
Profits	67	53	42	39	31	24	18	5
Deadlines	4	5	5	3	2	1	3	2

12. Given a set of 'n' elements Key[1..n] and the frequency of searching elements includes successful search probability list P[1..n] and unsuccessful search probability list Q[0..n]. Problem is to construct the Optimal BST for the given key elements such that the total search cost is as small as possible. Illustrate the algorithm using dynamic programming approach to obtain optimal binary search tree for the following data.

$n=5$	0	1	2	3	4	5
Keys[1..5]		15	32	38	41	59
P[1..5]		5	2	6	3	5
Q[0..5]	4	8	11	2	9	3

13. What is topological order of vertices of a DAG? Which traversal algorithm is used in finding topological order? Find the topological order for the following DAG.



14. Apply dynamic programming approach for solving the following 0/1 knapsack problem.

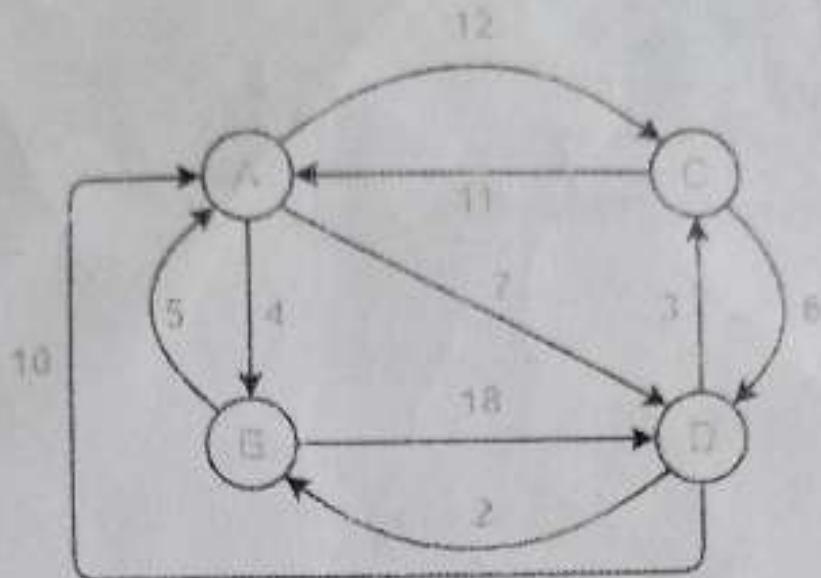
No. of Items: $n = 5$					
Item	1	2	3	4	5
Weight[1..5]	2	3	3	4	6
Profit[1..5]	1	2	5	9	4
Bag Capacity: $W = 10$					

PART A**Answer all the questions****10 x 2 = 20 Marks**

1. Compare Backtracking approach and Branch & Bound approach in solving problems.
2. What is negative weight cycle in a graph? Which algorithm is used to check whether a graph containing negative weigh cycle or not?
3. Predict the algorithm design strategy used in solving following problems.
(a) Prim's Algorithm for Minimum Spanning Tree (b) Floyd-Warshall Algorithm for Shortest Path Problem (c) String Editing Problem (d) Sum-of Subsets Problem
4. Differentiate between P and NP classes of problems.
5. How to prove a problem belongs to NP-Complete?
6. List out all the types of approximation algorithms used in solving bin-packing problem.
7. State Cook's theorem.
8. Dp algorithm design strategy requires more space complexity in solving problems. Brute force algorithm design strategy may need more unnecessary re-computations while solving some problems.
9. Relate decision problems with optimization problems.
10. Clarify the difference between the worst-case and best-case time complexity with LINEAR SEARCH algorithm.

PART B**Answer any two questions****2 x 10 = 20 Marks**

11. Compare NP-Hard and NP-Complete problems. Prove that the Travelling Salesman Problem is NP-Complete.
12. Apply the branch and bound strategy to solve the Travelling Salesperson Problem for the following graph. Assume the starting city is 'A'.



13. Design an algorithm using greedy approach to find a sequence of jobs, which is completed within their deadlines and gives maximum profit. Illustrate the algorithm for the following input.

n=8		Jobs With Profit & Deadlines							
Jobs	1	2	3	4	5	6	7	8	
Profits	67	53	42	39	31	24	18	5	
Deadlines	4	5	5	3	2	1	3	2	

PART C

Answer all questions

1 x 10 = 10 Marks

14. Describe Bin-Packing Problem. Find the optimal numbers of bins required for the following bin-packing problem. Apply all the four types of approximation algorithms.

Number of Objects: $n = 9$

Weight List: $w[1..9] = \{0.5, 0.7, 0.5, 0.2, 0.4, 0.2, 0.5, 0.1, 0.6\}$

Bin Capacity: $c = 1.0$



Part A

Answer ALL the questions:

(10 x 2 = 20)

- How the values of z are determined graphically for a maximization problem of LPP?
- State the limitations of the graphical method of solving a LPP.
- Explain the characteristics of the canonical form and hence express the following LPP in canonical form.

$\text{Max } Z = 2 X_1 + 3 X_2 + X_3$, subject to constraint

$4 X_1 - 3 X_2 + X_3 \leq 6$; $X_1 + 5 X_2 - 7X_3 \geq -4$ and $X_1, X_3 \geq 0$ and X_2 unrestricted

- While solving $\text{Max } Z = 3 X_1 + 2 X_2$, subject to constraints $2 X_1 + X_2 \leq 2$; $3 X_1 + 4 X_2 \geq 12$ and $X_1, X_2 \geq 0$.

The following table values are arrived

C_B	Y_B	X_B	X_1	X_2	s_1	s_2	R_I
2	X_2	2	2	1	1	0	0
-M	R_I	4	-5	0	-4	-1	1
	$Z_j - C_j$		$5M+1$	0	$4M+2$	M	0

What can you infer about the feasible solution?

- In the Phase I of two phase simplex method, a situation arises where objective function is less than zero and at least one

artificial variable appears in the optimum basis at a non - zero level. What can we say about the feasible solution and proceeding towards phase 2?

6. Explain unrestricted variable with an example in LPP.
7. What is the essential difference between the dual and regular simplex method?
8. Write the dual of the following primal LPP
 $\text{Max } Z = 3 X_1 + 10 X_2 + 2 X_3$, subject to the constraints
 $2 X_1 + 3 X_2 + 2 X_3 \leq 7; 3 X_1 - 2 X_2 + 4 X_3 \geq 6$ & $X_1, X_2, X_3 \geq 0$.
9. How the entering and leaving variables are decided in a dual simplex method?
10. In post optimality analysis which variations affects the feasibility of current solution.

Part B

Answer ALL the questions: $(3 \times 10 = 30)$

11. Use two - phase simplex method to

Minimize $Z = \frac{15}{2} X_1 - 3 X_2$ subject to the constraints

$3 X_1 - X_2 - X_3 \geq 3; X_1 - X_2 + X_3 \geq 2$ and $X_1, X_2, X_3 \geq 0$.

12. Use penalty method to maximize $Z = 3 X_1 - X_2$ subject to the constraints $2X_1 + X_2 \geq 2; X_1 + 3X_2 \leq 3; X_2 \leq 4, X_1, X_2 \geq 0$.
13. Use dual simplex method to solve the following L.P.P.:

Minimize $Z = 10 X_1 + 6 X_2 + 2 X_3$

subject to the constraints $-X_1 + X_2 + X_3 \geq 1$,

$3 X_1 + X_2 - X_3 \geq 2, X_1, X_2, X_3 \geq 0$.

PART A

Answer all the questions.

2 x 10 = 20 Marks

- What do you mean by balanced and unbalanced transportation problems?
- Explain how would you convert the unbalanced problem into a balanced one.

Using the Least cost method find the starting solution to the following problem:

Destination

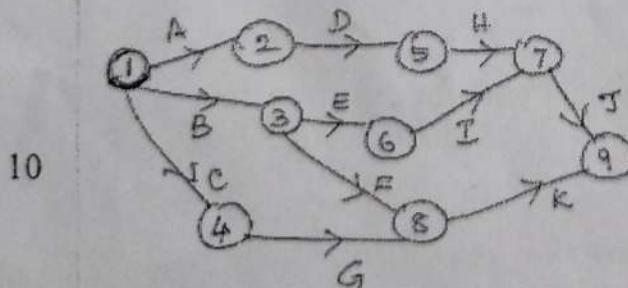
Source	Destination			Supply
	A	B	C	
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Destination	7	9	18	

- How do you resolve degeneracy in a transportation problem?
- Distinguish between transportation and assignment model.
- An assignment problem is always a degenerate form of a transportation problem. Explain.
- Discuss the maximization problem under the transportation problem.
- When we say an assignment problem has more than one optimal solution. Is there any variation in optimum assignment cost?

Construct the network for the following project whose activities and their precedence relationship are given

- Activity: A B C D E
 Immediate
 predecessor: --- A A A B,C,D

- How will you examine the cell evaluation d_{ij} of the unoccupied cells (i, j) and arrive at the conclusion about the optimal solution?



For the activities given in network write the precedence relationship

Answer any THREE the questions. $3 \times 10 = 30$ Marks

A company has received a contract to supply gravel for three new construction projects located in three towns A, B, C.

Project Location Weekly requirement(truck loads)

A	72
B	102
C	41

The company has 3 gravel pits located in towns W, X and Y and the gravel required by construction projects is supplied by three pits. Amount supplied by three pits to the cities A, B and C are 76, 82 and 77 respectively. Delivery cost from each pit to each project site

Project Location

Pit	A	B	C
W	4	8	8
X	16	24	16
Y	8	16	24

Schedule the shipment from each pit to each project in such a manner so as to minimize transportation cost.

Solve the following assignment problem to find the maximum expected sale.

Territory

Sales man	A	1	2	3	4
		42	35	28	21
	B	30	25	20	15
	C	30	25	20	15
	D	24	20	16	12

Solve the following assignment problem.

Machine

Task	A	1	2	3	4	5
		7	7	∞	4	8
	B	9	6	4	5	6
	C	11	5	7	∞	5
	D	9	4	8	9	4
	E	8	7	9	11	3

Draw the network and determine the critical path for the given data:

Jobs: 1-2 1-3 2-4 3-4 3-5 4-5 4-6 5-6

Duration: 6 5 10 3 4 6 2 9



School of Arts Sciences, Humanities & Education

II CIA Test – March 2023

Course Code: **MAT330R01**

Course Name: **Operations Research**

Duration: 90 minutes

Marks: 50

PART A

Answer all the questions.

$5 \times 2 = 10$

- Obtain the initial solution for the following transportation problem through Northwest corner rule.

Source	Destination			Supply
	A	B	C	
1	2	7	4	5
2	3	3	1	8
3	5	4	7	7
4	1	6	2	14
Demand	7	9	18	34

- What do you mean by balanced and unbalanced transportation problem? How to convert unbalanced transportation problem into a balanced one?
- An assignment problem is always a degenerate form of transportation problem. Explain.
- Explain how maximization problems in assignment models are solved.
- Construct the network diagram for the project activities:
A < D,E; B,D < F; C < G; B < H; F, G < I.

PARTB

Answer ANY FOUR the questions.

$4 \times 10 = 40$

- Food packets have to be airlifted by three aircrafts from an airport and air-dropped to five villages. The quantities that can be carried in one trip by these aircrafts to the village are given below. The total number of trips per day an aircraft can make to the villages are also given. Find the number of trips each aircraft should make to each village so that the total quantity of food transported is maximum

	V1	V2	V3	V4	V5	Trips/day by aircraft
A1	10	8	6	9	12	50
A2	5	3	8	4	10	90
A3	7	9	6	10	4	60
Trips / day to village	100	80	70	40	20	

- A batch of 4 jobs can be assigned to 5 different machines. The set up time in hours for each job on various machines is given below:

		Machine				
		1	2	3	4	5
Job	1	10	11	4	2	8
	2	7	11	10	14	12
	3	5	6	9	12	14
	4	13	15	11	10	7

Find an optimal assignment of jobs to machines which will minimize the total set up time.

8. A machine shop purchased a drilling machine and two lathes of different capacities. The positioning of the machines among 4 possible locations on the shop floor is important from the standard of materials handling. Given the cost estimate per unit time of materials below, determine the optimal location of the machine.

Location

	1	2	3	4
Lathe 1	12	9	12	9
Drill	15	Not suitable	13	20
Lathe 2	4	8	10	6

9. Calculate the total float, free float for the project whose activities are given below: Also determine the critical path of the project

Activity	1 - 2	1 - 3	1 - 5	2 - 3	2 - 4
Duration (in weeks)	8	7	12	4	10
Activity	3 - 4	3 - 5	3 - 6	4 - 6	5 - 6
Duration (in weeks)	3	5	10	7	4

10. Construct the network of the project whose activities and the three time estimates of these activities are given. Compute (a) Expected duration of each activity (b) Expected variance of each activity (c) Expected variance of the project length.

Activity	1 - 2	2 - 3	2 - 4	3 - 5	4 - 5	4 - 6
t_0	3	1	2	3	1	3
t_m	4	2	3	4	3	5
t_p	5	3	4	5	5	7
Activity	5 - 7	6 - 7	7 - 8	7 - 9	8 - 10	9 - 10
t_0	4	6	2	1	4	3
t_m	5	7	4	2	6	5
t_p	6	8	6	3	8	7



PART A

Answer all the questions.

$2 \times 5 = 10$

1. Describe briefly the two-phase method of solving a LPP with artificial variables.
2. Describe an unbalanced assignment model. How do convert it to a balanced assignment model?
3. Explain the Kendall's notation for representing the queueing models. And hence explain the notation in the four models.
4. In a railway marshalling yard, Goods train arrive at a rate of 15 trains per day. Assuming that inter arrival time follows an exponential distribution and service also exponential, with an average of 36 minutes. Calculate the utilization factor.
5. If the demand for a certain product has a rectangular distribution between 4000 and 5000, Find the optimal order quantity if shortage cost is Re.1 per unit and shortage cost is Rs. 7 per unit.

PARTB

Answer any THREE the questions.

$3 \times 10 = 30$

- Food X contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and costs 12 paise per gram. Food Y contains 8 units of vitamin A per gram and 12 units of vitamin B per gram. The daily minimum requirements of vitamin A and vitamin B are 100 units and 120 units respectively. Find the minimum cost of the product mix.

A truck owner finds from his past records that the maintenance costs per year of a truck whose purchase price is Rs.8000 are as given below:

Year	:	1	2	3	4	5	6	7	8
------	---	---	---	---	---	---	---	---	---

Maintenance

7. Cost Rs. : 1,000 1,300 1,700 2,200 2,900 3,800 4,800
6,000

Resale Price

Rs. :	4,000	2,000	1,200	600	500	400	400	400
-------	-------	-------	-------	-----	-----	-----	-----	-----

Determine at which time it is profitable to replace the truck.

- Consider a self-service store with one cashier. Assume Poisson arrivals and exponential service times. Suppose that nine customers arrive on the average every 5 minutes and the casheir can serve 10 in 5 minutes. Find
8. (i) The average number of customers queueing for service.
 - (ii) The probability of having more than 10 customers in the system.

9. Find the most economic batch quantity of a product on a machine if the production rate of that item is 200 pieces per day and the demand is uniform at the rate of 100 pieces per day. The set-up cost is Rs.200 per batch and the cost of holding one item in inventory is Re.0.81 per day. How will the batch quantity vary if the machine production rate is infinite?

Part C

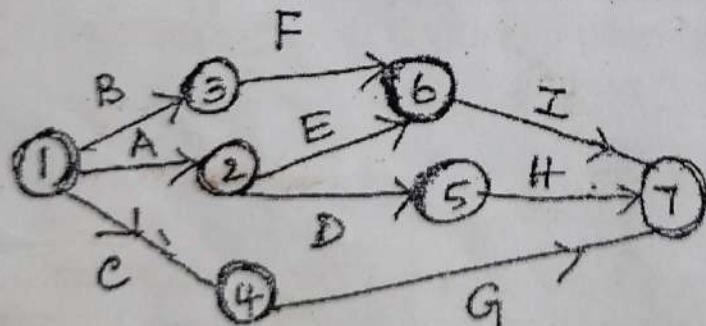
Answer the following (Compulsory)

1x 10 = 10

A Project is represented by the network shown below and has the following data:

Task	A	B	C	D	E	F	G	H	I
Least time :	5	18	26	16	15	6	7	7	3
Greatest time:	10	22	40	20	25	12	12	9	5
Most likely time:	8	20	33	18	20	9	10	8	4

10.



Determine the following:

- (i) Expected task times and their variance.
- (ii) Critical path



School of Arts Science & Humanities,
Education

III CIA Test – May 2023

Course Code: MAT330R01

Course Name: Operations Research

Duration: 90 minutes Marks: 50

Part A

Answer ALL the questions: (5 x 2 = 10)

1. What is the difference between slack and surplus variable?
2. Define an unbalanced assignment problem and describe the steps involved in solving it.
3. The annual demand for an item is 3200 units. The unit cost is Rs. 6 and inventory carrying charges 25% per annum. If the cost of one procurement is Rs. 150. Determine the Economic order quantity.
4. In a railway Marshalling yard, goods train arrive at a rate of 30 trains per day. Assuming that inter arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes. Calculate the traffic intensity.
5. A pipeline is due for repairs. It will cost Rs. 10000 and lasts for 3 years. Alternatively a new pipeline can be laid at a cost of Rs.30000 and lasts for 10 years. Assuming cost of capital to be 10% and ignoring salvage value. What is the present worth factor of the capital?

Part B

Answer any THREE questions: (3 x 10 = 30)

6. Solve by simplex method:

$$\text{Minimize } Z = x_1 - 3x_2 + 2x_3$$

$$\text{Subject to } 3x_1 - x_2 + 2x_3 \leq 7$$

$$-2x_1 + 4x_2 \leq 12$$

$$-4x_1 + 3x_2 + 8x_3 \leq 10$$

$$x_1, x_2, x_3 \geq 0$$

7. Solve the transportation problem

Source	Destination				Supply
	A	B	C	D	
1	11	20	7	8	50
2	21	16	20	12	40
3	8	12	18	9	70
Demand	30	25	35	40	

8. A newspaper boy buys paper for Rs.1.40 and sells them for Rs.2.45. He cannot return unsold newspapers. Daily demand has the following distribution.

Customer	25	26	27	28	29	30
Probability	0.03	0.05	0.05	0.10	0.15	0.15

Customer	31	32	33	34	35	36
Probability	0.12	0.10	0.10	0.07	0.06	0.02

If each day's demand is independent of the previous days, how many papers do should order each day?

9. People arrive at a Theatre ticket booth in Poisson distributed arrival rate of 25 per hour. Service time is constant at 2 minutes. Calculate
 (a) The mean number in the waiting line.
 (b) The mean waiting time
 (c) Traffic intensity or utilization factor.

Part C

Answer the following question : $(1 \times 10 = 10)$

10. The cost of the machine is Rs.6100 and its scrap value is Rs.100.

The maintenance costs found from experience are as follows:

Year	1	2	3	4
Maintenance cost	100	250	400	600

Year	5	6	7	8
Maintenance cost	900	1200	1600	2000

When the machine should be replaced?