

AR20

CODE: 20BST102

SET-1

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

I B. Tech II Semester Supplementary Examinations, August - 2025

**Differential Equations
(Common to All Branches)**

Time: 3 Hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. a) *solve* $\{y(1 - x \tan x) + x^2 \cos x\}dx - xdy = 0$ 5M
b) Show that family of curves $x^2 + 4y^2 = C_1$ and $y = C_2x^4$ are 5M
(mutually) orthogonal.

(OR)

2. A substance cools from 370 k to 330 k in 10 mts, when the temperature of the surrounding air is 290 k, find the temperature of the substance after 40 mts. 10M

UNIT-II

3. a) Solve : $y'''' + 6y''' + 9y'' = 0$ 5M
b) Solve $(D - 2)^3y = e^{2x}$ 5M

(OR)

4. Solve, by the method of variation parameters, 10M
 $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = e^x \log x$

UNIT-III

5. Find Fourier series for $f(x) = x^2$ in the interval 10M
 $[-\pi, \pi]$. Hence show that $\sum \frac{1}{n^2} = \frac{\pi^2}{6}$

(OR)

6. a) $f(x) = 1 - \frac{x}{L}$ in $0 < x < L$ find Fourier cosine series. 5M
b) Obtain Fourier series expansion of $f(x) = x \cdot \cos\left(\frac{\pi x}{L}\right)$ in the interval 5M
 $-L \leq x \leq L$.

UNIT-IV

7. a) Find the differential equation of all spheres whose centres lie on the z-axis. 5M
b) Solve: $(x + y)\phi(x^2 + y^2)$ 5M
- (OR)
8. a) Solve: $z = f(x + y).g(x - y)$ by using elimination of two arbitrary functions 5M
b) Solve : $xyz = f(x + y + z)$ by using elimination of two arbitrary function of specific functions 5M

UNIT-V

9. a) Find the complete solution : $p^2 + q^2 = npq$ 5M
b) Solve : $zpy^2 = x(y^2 + z^2q^2)$. 5M
- (OR)
10. Solve $x^2(y - z)p + y^2(z - x)q = z^2(x - y)$ 10M

UNIT-VI

11. Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, where $u(x,0) = 6e^{-3x}$ by the method of separation of variables. 10M
- (OR)
12. a) Find the displacement of a string stretched between the fixed points $(0, 0)$ and $(1, 0)$ and released from rest from the position $A \sin \pi x + B \sin 2\pi x$. 5M
b) Solve $u_t = c^2 u_{xx}$ when 5M
i). $u = \infty$ as $t \rightarrow \infty$
ii). $u_x = 0$ when $x = 0$ for all t
iii). $u = 0$ when $x = L$ for all t
iv). $u = u_0 = \text{constant}$
when $t = 0$ for $0 < x < L$.

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

- | | Marks | CO | BTL |
|--|-------|----|-----|
| 1. a) Analyze the relationship between the protagonist and the other characters in the story The Power of a Plate of Rice. | 7 | 1 | K3 |
| b) Skim the passage below and fill in the blanks with the most appropriate word from the options provided. | 7 | 1 | K3 |

In recent decades, the world has experienced significant changes in the way people live, work, and interact with one another. The rise of the internet and social media has brought about a (1) _____ shift in communication. Today, most people are connected online, and information can be shared almost instantly. While this has its (2) _____, such as convenience and speed, it also raises concerns about privacy and the spread of misinformation. Many people now rely on social media to (3) _____ their opinions, and this has led to a growing (4) _____ between different groups in society. In response to these challenges, experts have called for more regulation of online platforms to ensure that they are used (5) _____ and responsibly. Governments around the world are also considering new laws that would (6) _____ the power of tech giants and give users more control over their data. However, the debate is ongoing, and it remains to be seen how these changes will (7) _____ the future of online communication.

Options:

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|---------------|------------------|----------------|
| a) minor | b) drastic | c) neutral |
| a) advantages | b) disadvantages | c) mistakes |
| a) remain | b) broadcast | c) express |
| a) unity | b) separation | c) agreement |
| a) recklessly | b) carefully | c) unwillingly |
| a) enhance | b) reduce | c) ignore |
| a) impact | b) ignore | c) reverse |

(OR)

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|---|---|---|----|
| 2. a) How might the lessons learned from The Power of a Plate of Rice be applied to real-life situations of scarcity or resource-sharing? | 7 | 1 | K2 |
| b) Fill in the blanks by adding the correct prefix or suffix to the base words provided in the brackets. | 7 | 1 | K3 |

In today's globalized world, businesses and individuals alike must be able to adapt quickly to an ever-changing environment. The demand for (1) _____ (reliable) workers is greater than ever, as companies require employees who can deal with

uncertainty and challenges in a flexible manner. This has led to the rise of entrepreneurial individuals who are willing to take risks and innovate in ways that were once considered (2) _____ (impossible). The ability to think creatively and respond (3) _____ (resource) is crucial to success in the modern workplace. However, there are many challenges associated with these expectations, including the pressure to perform (4) _____ (consistent) under stress. As a result, mental health has become a major concern for many workers, with anxious levels rising across all industries. There is a growing need for training programs that focus on the well-being of employees and provide strategies for coping with the mental demands of modern work life. It is also essential for employers to foster an (5) _____ (inclusive) environment that promotes collaboration and respect for diversity. Only by adopting these practices can we expect a (6) _____ (sustainable) future for workforces around the world. Furthermore, it is important to maintain (7) _____ (optimistic) even in the face of setbacks, as this mindset is often the key to long-term success.

UNIT-II

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| 3. | a) Illustrate the poet's imagery in the poem "Night of the Scorpion" and highlight the intensity of the mother's pain. | 7 | 2 | K2 |
| | b) Fill in the blanks with "a," "an," or "the". | 7 | 2 | K3 |
| | a. I saw ____ eagle soaring high in the sky. | | | |
| | b. She has ____ unique perspective on life. | | | |
| | c. We stayed in a hotel by the beach. ____ hotel had a beautiful view. | | | |
| | d. He bought ____ orange and ____ apple from the market. | | | |
| | e. Can you pass me ____ sugar, please? | | | |
| | f. My mother is ____ honest person. | | | |
| | g. We visited ____ Eiffel Tower last summer. | | | |

(OR)

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| 4. | a) How do the family members react to the mother's suffering, and what does this reveal about their beliefs? | 7 | 2 | K2 |
| | b) Write a descriptive paragraph in about 100-150 words on "How Technology Has Changed Our Lives". | 7 | 2 | K2 |

UNIT-III

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| 5. | a) What is the significance of the "Think Different" campaign in reflecting Jobs' personal and professional values? | 7 | 3 | K2 |
| | b) Read the given text and make notes in Cornell Method. | 7 | 3 | K3 |
- Conflict is an inevitable part of human interactions, whether in personal relationships, workplaces, or communities. Effective conflict resolution is crucial for maintaining harmony and fostering positive relationships. The first step in resolving a conflict is recognizing that it exists and acknowledging the perspectives of all parties involved. Open communication is key – each person should be given the opportunity to express their thoughts and feelings without judgment.

Listening actively is just as important as speaking, as it shows respect and helps in understanding the underlying causes of the conflict. Once both sides have been heard, finding common ground and working towards a solution that benefits everyone is essential. Compromise may be necessary, but the focus should be on mutual respect and collaboration. In some cases, mediation or professional help may be required. Ultimately, resolving conflicts in a healthy way strengthens relationships and creates an environment where everyone feels valued and understood.

(OR)

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| 6. a) | How did Steve Jobs' vision for Apple differ from other technology companies during his time? | 7 | 3 | K2 |
| b) | Fill in the blanks with the correct form of the verb. (Use the tense indicated in the brackets) | 7 | 3 | K3 |
| a) | If I had known about the change, I _____ (attend) the meeting. (Past Perfect) | | | |
| b) | I _____ (wait) for her at the station when I saw the news. (Past Continuous) | | | |
| c) | By the time we arrived, they _____ (already leave) for their holiday. (Past Perfect) | | | |
| d) | By this time next week, we _____ (sign) the contract. (Future Perfect) | | | |
| e) | While I _____ (work) on the report, the phone rang. (Past Continuous) | | | |
| f) | We _____ (study) for the exam when the teacher walked in. (Past Continuous) | | | |
| g) | She will be staying in London next month, but she _____ (decide) to go to New York instead. (Past Perfect) | | | |

UNIT-IV

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| 7. a) | Do you think Saki's portrayal of the children's violent tendencies challenges the idealistic notion of innocent childhood? Justify. | 7 | 4 | K2 |
| b) | Draft a résumé for the position of Project Manager at an MNC. Highlight your project management experience, leadership skills, and technical knowledge relevant to the role. | 7 | 4 | K2 |

(OR)

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| 8. a) | How could the lesson in The Toys of Peace be applied to parenting in today's world? | 7 | 4 | K2 |
| b) | Fill in the blanks with an appropriate word given in the brackets: | 7 | 4 | K3 |
| a) | The scientist was able to _____ (accept/except) the award on behalf of the team. | | | |
| b) | The severe storm had a terrible _____ (affect/effect) on the coastal town. | | | |
| c) | He is one of the most _____ (principal/principle) investors in the company. | | | |
| d) | The lawyer advised her to _____ (ensure/insure) her property against damage. | | | |
| e) | The manager was impressed by his _____ (discreet/discrete) handling of the sensitive information. | | | |

f) We need to _____ (precede/proceed) with the meeting despite the delay.

g) The students were asked to summarize the _____ (imply/infer) meaning of the text.

UNIT-V

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| 9. | a) | Identify and explain the psychological mechanisms that make intrapersonal communication essential for effective self-regulation and goal-setting. | 7 | 5 | K2 |
| | b) | Write an essay in about 250 - 300 words on the topic "The Future of Engineering Careers". | 7 | 5 | K2 |

(OR)

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| 10. | a) | Explain the role of self-reflection in enhancing intrapersonal communication. | 7 | 5 | K2 |
| | b) | Read the text and answer the questions: | 7 | 5 | K3 |

Workplace skills are the competencies and attributes that help individuals succeed in their professional environment. These skills range from technical abilities to interpersonal skills that enable smooth collaboration within teams. Technical skills are often specific to a particular job, such as proficiency in software or machinery. However, soft skills like teamwork, leadership, and adaptability are just as crucial. Teamwork involves collaborating effectively with others, sharing tasks, and supporting colleagues to achieve a common goal. Leadership skills include guiding and motivating team members, making decisions, and handling challenges. Adaptability is the ability to adjust to changes in the workplace, whether it's adopting new technologies or shifting organizational goals. Communication is another key workplace skill, allowing individuals to clearly express ideas, listen to others, and resolve conflicts professionally. Problem-solving and critical thinking also play a pivotal role in identifying issues and proposing solutions. The combination of technical expertise and soft skills ensures that employees contribute positively to their organizations, build strong working relationships, and achieve their career goals.

Questions:

- What are workplace skills? Give an example.
- Differentiate technical vs. soft skills in the workplace.
- Why is teamwork important for achieving workplace goals?
- What are the key responsibilities of a leader?
- How does adaptability benefit employees?
- Why is communication considered a key workplace skill?
- How does problem-solving play a key role in workplace?

DATA STRUCTURES**(Common to CSE, CSE(DS), CSE(AIML) and IT Branches)****Time: 3 Hours****Max Marks: 70****Answer ONE Question from each Unit****All Questions Carry Equal Marks****All parts of the Question must be answered at one place**

	<u>UNIT-I</u>	Marks	CO	BTL
1. a)	Define basic concepts of data structures and provide examples of commonly used data structures.	7	CO1	1
b)	Explain about the notations of time and space complexity.	7	CO1	2
	(OR)			
2. a)	Explain the following asymptotic notations, considering best-case, worst-case, and average-case scenarios.	7	CO1	2
b)	Differentiate between iterative and recursive algorithms with some examples.	7	CO1	3
	<u>UNIT-II</u>			
3. a)	Explain Binary Search algorithm highlighting the time complexity.	7	CO2	2
b)	Describe Linear probing in hashing to store elements in a hash table.	7	CO2	1
	(OR)			
4. a)	Write the Insertion sort algorithm and mention its time complexity.	7	CO2	1
b)	Explain Quick sort technique with an example.	7	CO2	1
	<u>UNIT-III</u>			
5. a)	Develop a pseudocode to traverse a single linked list and display its elements iteratively.	7	CO3	1
b)	Discuss any two advantages of using circular linked lists in certain scenarios.	7	CO3	4
	(OR)			
6. a)	Explain Doubly linked list creation, insertion and deletion operations.	7	CO3	4
b)	Write the Circular linked list creation, insertion and deletion operations.	7	CO3	4
	<u>UNIT-IV</u>			
7. a)	Write an algorithm to implement a circular queue using an array. Include functions for enqueue and dequeue operations.	7	CO4	1
b)	Write a pseudo code for converting an infix expression to postfix notation and then give an example.	7	CO4	1
	(OR)			
8. a)	Illustrate stack push and pop operations using arrays.	7	CO4	4
b)	Explain simple queue operations using arrays.	7	CO4	4
	<u>UNIT-V</u>			
9. a)	Explain Dijkstra's algorithm for finding the shortest path in a weighted graph and give an example.	10	CO5	2
b)	Define basic terminologies associated with binary trees. Provide examples to illustrate each term.	4	CO5	1
	(OR)			
10. a)	Differentiate between BFS and DFS.	7	CO5	3
b)	Explain about Binary Search Tree Operations.	7	CO5	1