R20

II BTECH I SEM

END EXAMINATION QUESTION PAPERS

SUPPLEMENTARY

OCT./NOV.. 2025

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CC2101

II B.Tech. - I Semester Supple Examinations, October-2025
NUMERICAL METHODS AND TRANSFORMATIONS
(CE,EEE,ME,ECE)

Time: 3 hours | **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

<table>
<tr><th>QNo</th><th></th><th>Questions</th><th>KL</th><th>CO</th><th>Marks</th></tr>
<tr><td rowspan="6">1</td><td colspan="5">Unit-I</td></tr>
<tr><td rowspan="2">a</td><td>(i) Find the root of the equation $x - xe^x = 0$ correct up to three decimal places, lying between 0.5 and 0.7 using Regula-falsi method.</td><td>3</td><td>1</td><td>7M</td></tr>
<tr><td>(ii) By using Lagrange's formula, find y when x = 10.
<table>
<tr><td>x</td><td>5</td><td>6</td><td>9</td><td>11</td></tr>
<tr><td>y = f(x)</td><td>12</td><td>13</td><td>14</td><td>16</td></tr>
</table></td><td>3</td><td>1</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>(i) Find the real root of the equation $3x = \cos x + 1$, correct up to four decimal places, by Newton-Raphson method.</td><td>3</td><td>1</td><td>7M</td></tr>
<tr><td>(ii) From the following table, estimate the number of students who obtained marks at x= 45
<table>
<tr><td>Marks</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>70-80</td></tr>
<tr><td>Number of Students</td><td>31</td><td>42</td><td>51</td><td>35</td><td>31</td></tr>
</table></td><td>3</td><td>1</td><td>7M</td></tr>
<tr><td rowspan="6">2</td><td colspan="5">Unit-II</td></tr>
<tr><td rowspan="2">a</td><td>(i) Evaluate y(0.1) correct to four decimal places using the Taylor's series method if $\frac{dy}{dx} = y^2 + x,\ y(0) = 1.$</td><td>3</td><td>2</td><td>7M</td></tr>
<tr><td>(ii) A rocket is launched from the ground. Its acceleration is registered during the first 80 seconds and is given as follows:
<table>
<tr><td>t(s)</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td><td>50</td><td>60</td><td>70</td><td>80</td></tr>
<tr><td>a (m/s^2)</td><td>30</td><td>31.63</td><td>33.34</td><td>35.47</td><td>37.75</td><td>40.33</td><td>43.25</td><td>46.69</td><td>50.67</td></tr>
</table>
By Simpson's 1/3rd rule, find the velocity at t = 80 sec.</td><td>3</td><td>2</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>(i) Find the value of y for $\frac{dy}{dx} = x + y,\ y(0) = 1$ when x = 0.1, 0.2 with step size h = 0.05 by using R-K method</td><td>3</td><td>2</td><td>7M</td></tr>
<tr><td>(ii) Evaluate $\int_0^1 e^{-x^2}\,dx$ with n = 10 using the Trapeziodal rule.</td><td>3</td><td>2</td><td>7M</td></tr>
<tr><td rowspan="5">3</td><td colspan="5">Unit-III</td></tr>
<tr><td rowspan="2">a</td><td>(i) Find the Laplace transform of the function $\frac{\cos 2t \sin t}{e^t}$.</td><td>3</td><td>3</td><td>7M</td></tr>
<tr><td>(ii) Find the inverse Laplace transform of the function $\tan^{-1}\left(\frac{2}{s^2}\right)$.</td><td>3</td><td>3</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>b</td><td>(i) Find the Laplace transform of the function $\frac{\cos at - \cos bt}{t}$.</td><td>3</td><td>3</td><td>7M</td></tr>
</table>

		(ii) Find the inverse Laplace transform of the function $\frac{s+2}{s(s+1)(s+3)}$.	3	3	7M
4		**Unit-IV**			
	a	(i) Find the Fourier series of $f(x)=\begin{cases}-1, & 0<x<\pi\\ 2, & \pi<x<2\pi\end{cases}$.	3	4	7M
		(ii) Find the half-range sine series of $f(x) = lx - x^2$ in the interval $(0, l)$	3	4	7M
		OR			
	b	(i) Find the Fourier series of $f(x) = e^{ax}$ in the interval $(-\pi, \pi)$	3	4	7M
		(ii) Find the half-range cosine series of $f(x)=\begin{cases}1, & 0\le x\le 1\\ x, & 1\le x\le 2\end{cases}$.	3	4	7M
5		**Unit-V**			
	a	(i) Find the Fourier transform of $f(x)=\begin{cases}1, & \lvert x\rvert<a\\ 0, & \lvert x\rvert>a\end{cases}$. Hence find the value of $\int_0^\infty \frac{\sin x}{x}\,dx$.	3	5	7M
		(ii) Find the Fourier cosine and sine transforms of $f(x) = 2e^{-5x} + 5e^{-2x}$.	3	5	7M
		OR			
	b	(i) Find the Fourier transform of $f(x)=\begin{cases}a-\lvert x\rvert, & \lvert x\rvert\le a\\ 0 & \lvert x\rvert>a\end{cases}$. Hence, show that $\int_0^\infty \frac{\sin^2 x}{x^2}\,dx=\frac{\pi}{2}$.	3	5	7M
		(ii) Find the Fourier cosine and sine transforms of $f(x)=\begin{cases}1, & 0<x<a\\ 0, & x>a\end{cases}$.	3	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

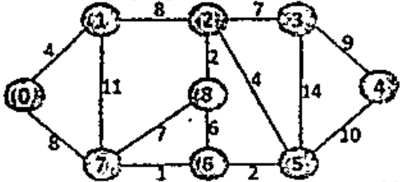
NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CC2102

II B.Tech. - I Semester Supple Examinations, October-2025
MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
(CSE,IT,AI)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

No		Questions	K L	CO	Marks
1		**Unit-I**			
	a	**(i) Identify** whether (p→q)→r, p→(q→r) are logically equivalent or not.	K3	CO1	7M
		(ii) Construct truth tables for $(p \wedge (q \vee r))$, $(p \rightarrow (q \leftrightarrow r))$.	K3	CO1	7M
		OR			
	b	**(i) Prove** that $(p \vee \neg p)$ is a tautology and $(p \wedge \neg p)$ is a contradiction.	K3	CO1	7M
		(ii) Build PDNF and PCNF of $(\neg p \vee (q \wedge r))$.	K3	CO1	7M
2		**Unit-II**			
	a	**(i) Translate** into predicate logic: (i) Every prime is odd. (ii) Some even numbers are prime.	K3	CO2	7M
		(ii) Make use of mathematical induction prove that $1.2+2.3+3.4+\dots\dots\dots+n(n+1)=\frac{n(n+1)(n+2)}{3}$ Where n is a positive integer.	K3	CO2	7M
		OR			
	b	(i) Explain **Predicate Calculus** in detail. Discuss **predicates, statement functions, quantifiers (universal & existential), free and bound variables**, and illustrate how they are used in the **theory of inference** with suitable examples.	K3	CO2	14M
3		**Unit-III**			
	a	(i) Define the following graph with one suitable examples for each graphs (i) complement graph (ii) subgraph (iii) induced subgraph (iv) spanning subgraph	K3	CO3	7M
		(ii) Write the difference between Hamiltonian graphs and Euler graphs	K4	CO3	7M
		OR			
	b	(i) Explain union, intersection, and complement of graphs with examples.	K4	CO3	7M
		(ii) Apply Krushkal's algorithm to find the minimal spanning tree of the following graph 	K4	CO3	7M
4		**Unit-IV**			

a	(i) Solve the recurrence relation R $a_n=7a_{n-1}-10a_{n-2}$ with initial condition $a_0=4$ & $a_1=17$.	K3	CO4	7M
	(ii) Solve the recurrence relation $a_n = a_{n-1} + n(n+1)/2$.	K3	CO4	7M
OR				
b	(i) Solve the recurrence relation using generating functions $a_n-9a_{n-1}+20a_{n-2}=0$ for $n\geq2$ and $a_0=-3,a_1=-10$.	K3	CO4	7M
	(ii) Solve the recurrence relation $a_r= a_{r-1} + a_{r-2}$ Using generating function.	K3	CO4	7M
Unit-V				
a	(i) In how many arrangements of the word *CORRESPONDENTS* can be arranged so that I)There are exactly two pairs of consecutive identical letters ? II)There are at least three pairs of consecutive identical letters?	K4	CO5	14M
OR				
b	(i) Discover the disjunctive normal form of the Boolean function $f(x_1, x_2, x_3) = x_2(x_1x_3 + x_1)$	K4	CO5	7M
	(ii) Find the number of positive integer less than 10,000 and are divisible by 5or 7	K2	CO5	7M

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CC2103

II B.Tech. - I Semester Supple Examinations, October-2025

OOPS THROUGH JAVA

(CSE,IT,AI, AIML,DS & CY)

Time: 3 hours **Max. Marks: 70**

Note: Answer All FIVE Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
1		**Unit-I**			
	a	i) List and explain the principles of OOP.	K2	1	7M
		ii) Explain different datatypes available in JAVA with an example program.	K2	1	7M
		OR			
	b	i) Explain the use of "this" keyword with an example program.	K2	1	7M
		ii) Develop a JAVA program that performs addition of two matrices.	K3	1	7M
2		**Unit-II**			
	a	i) Infer the use of static variable in JAVA with an example program.	K2	2	7M
		ii) Explain method overriding in JAVA with example program.	K2	2	7M
		OR			
	b	i) Illustrate the use of default methods in interfaces with an example program.	K2	2	7M
		ii) List and explain the use of Object class in JAVA and explain any 5 methods of it.	K2	2	7M
3		**Unit-III**			
	a	i) List and explain any four methods of String and StringBuffer classes.	K2	3	7M
		ii) Explain the procedure of creating customized exception with an example program.	K3	3	7M
		OR			
	b	i) Construct a JAVA program that creates multiple threads using runnable interface concept.	K3	3	7M
		ii) Explain the use of thread priorities in JAVA with an example program.	K2	3	7M
4		**Unit-IV**			
	a	i) Explain the hierarchy of collection framework classes in JAVA.	K2	4	7M
		ii) Explain the use of LinkedList class in JAVA and list its important methods.	K2	4	7M
		OR			
	b	i) Infer the differences between byte and character stream classes in JAVA. Also list and explain any two classes in each category.	K2	4	7M
		ii) Develop a JAVA program that performs copying the content from one file into another file.	K3	4	7M
5		**Unit-V**			
	a	i) Explain how parameters are passed to applets with an example program.	K2	5	7M

		ii) Explain any three components of AWT with proper coding examples.	K2	5	7M
	OR				
	b	i) Identify the need of Adapter class in JAVA with respect to key or mouse event handling mechanism. Explain with suitable example.	K3	5	7M
		ii) List different types of layout managers in JAVA. Explain any one mechanism with a simple example.	K2	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CC2104

II B.Tech. - I Semester Supple Examinations, October-2025
DATA STRUCTURES

Time: 3 hours **Max. Marks: 70**

Note: Answer All FIVE Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	Write the pseudo code to implement facorial of a given number	K4	CO2	7M
		Explain space complexity and time complexity an example?	K4	CO2	7M
		OR			
	b	Define Data Structure. Specify the operations of Data Structures.	K3	CO2	7M
		Write the pseudo code to implement gcd of a number	K4	CO2	7M
2		**Unit-II**			
	a	Explain Linear search algorithm with an example	K3	CO1	7M
		Trace the steps of recursive merge sort algorithm to sort the following elements: 102, 205, 50, 90, 10, 840, 603, 70, 150, 40, 30.	K4	CO1	7M
		OR			
	b	Explain Fibonacci search algorithm with an example	K3	CO1	7M
		Sort the elements using Quick Sort: 62, 48, 91, 32, 58, 23, 79, 103, 24, 55, 68, 89, 82	K4	CO1	
3		**Unit-III**			
	a	Convert the given infix Expression ((A+B)/C-(D-E)*(F+G)) into its equivalent Postfix Notations.	K4	CO2	7M
		Explain the basic operations of queue with pseudo code.	K3	CO2	7M
		OR			
	b	Write a Program to find the Factorial of a Number using Stacks.	K4	CO2	7M
		Explain about Circular Queues implementation? Write the pseudo code for the operations on Circular Queues?	K3	CO2	7M
4		**Unit-IV**			
	a	List various operations of linked list and explain how to insert a node anywhere in the list.	K3	CO2	7M
		Write an algorithm to delete an element from doubly linked list	K4	CO2	7M
		OR			
	b	Compare singly and circular linked list while performing insertion and deletion operations.	K3	CO2	7M
		Write an algorithm to insert a node at the end of a circular linked list.	K4	CO2	7M
5		**Unit-V**			
	a	Explain various Tree Traversals methods with an example.	K3	CO3	7M
		Explain adjacency matrix and adjacency list with suitable examples	K3	CO4	7M

	OR				
	b	Explain binary search tree operations in detail.	K3	CO3	7M
		Explain Krushal's algorithm with an example?	K3	CO4	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NEC ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CC2105

II B.Tech. - I Semester Supple Examinations, October-2025
FRONT END WEB TECHNOLOGIES

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions. All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
1		**Unit-I**			
	a	Create an HTML page that uses various text formatting tags to style content.	K2	CO1	7M
		Write an HTML program to create your college timetable.	K3	CO1	7M
		OR			
	b	Create circles and rectangles using Canvas in HTML5.	K6	CO2	7M
		Create a simple HTML form that collects user input for name, email, DOB and a message.	K3	CO2	7M
2		**Unit-II**			
	a	Compare inline, internal, and external CSS with their advantages and disadvantages.	K4	CO3	7M
		Explain. Displaying, positioning and floating an element in CSS.	K5	CO3	7M
		OR			
	b	Develop a webpage that showcases different font styles, background styles, including images, gradients, and transparency effects.	K6	CO3	14M
3		**Unit-III**			
	a	How are arrays created and accessed in JavaScript? Explain with example.	K2	CO4	7M
		Develop JavaScript program to find out the Factorial of given number.	K3	CO4	7M
		OR			
	b	Demonstrate the process of dynamically changing the visibility of elements in JavaScript.	K4	CO4	7M
		Define regular expressions and explain their usage in JavaScript.	K2	CO4	7M
4		**Unit-IV**			
	a	List and Explain Event wrapper methods in jQuery.	K4	CO5	7M
		What is JQuery? Explain about i) Filter( ) ii) Slice( ) iii) add( )	K2	CO5	7M
		OR			
	b	Evaluate the use of persistent event handlers in jQuery.	K4	CO5	7M
		Explain how custom events can be created in jQuery with an example.	K3	CO5	7M
5		**Unit-V**			
	a	Evaluate the use of persistent event handlers in jQuery.	K4	CO6	7M
		Explain how to make a list sortable using jQuery UI.	K2	CO6	7M
		OR			
	b	Evaluate the use of the accordion widget in jQuery UI for organizing content.	K4	CO6	7M
		Analyze the role of the dialog widget in enhancing user interaction in a web application.	K4	CO6	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA
NEC ENGINEERING COLLEGE
(AUTONOMOUS)

II B.Tech I Semester Supple. Examinations, October-2025

Sub Code: R20CC2106 **PROBABILITY & STATISTICS**

Time: 3 hours CSE (CS, AIML, DS) Max. Marks: 70

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks (5 X 14 = 70M)

<table>
<tr><th>Q.No</th><th></th><th>Questions</th><th>KL</th><th>CO</th><th>M</th></tr>
<tr><td rowspan="6">1</td><td colspan="5">Unit-I</td></tr>
<tr><td rowspan="2">a</td><td>i) Find the mean and mode the following data.
<table>
<tr><td>Classes</td><td>0-30</td><td>30-60</td><td>60-90</td><td>90-120</td><td>120-150</td><td>150-180</td><td>180-210</td></tr>
<tr><td>Freq</td><td>2</td><td>3</td><td>5</td><td>10</td><td>3</td><td>5</td><td>2</td></tr>
</table></td><td>3</td><td>1</td><td>7M</td></tr>
<tr><td>ii) Find the mean deviation from mean for the following data:
<table>
<tr><td>Classes</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td><td>50-60</td><td>60-70</td><td>70-80</td></tr>
<tr><td>Freq.</td><td>2</td><td>3</td><td>8</td><td>14</td><td>8</td><td>3</td><td>2</td></tr>
</table></td><td>3</td><td>1</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>i) Write down the differences between the primary and secondary data?</td><td>1</td><td>1</td><td>7M</td></tr>
<tr><td>ii) Calculate Bowley's coefficient of skewness to the following data
<table>
<tr><td>Weight (lb)</td><td>70-80</td><td>80-90</td><td>90-100</td><td>100-110</td><td>110-120</td><td>120-130</td><td>130-140</td><td>140-150</td></tr>
<tr><td>No. of pounds</td><td>12</td><td>18</td><td>35</td><td>42</td><td>50</td><td>45</td><td>20</td><td>8</td></tr>
</table></td><td>4</td><td>1</td><td>7M</td></tr>
<tr><td rowspan="6">2</td><td colspan="5">Unit-II</td></tr>
<tr><td rowspan="2">a</td><td>i)Fit the second degree polynomial to the following data by the method of least squares.
<table>
<tr><td>X</td><td>10</td><td>12</td><td>15</td><td>23</td><td>20</td></tr>
<tr><td>y</td><td>14</td><td>17</td><td>23</td><td>25</td><td>21</td></tr>
</table></td><td>4</td><td>2</td><td>7M</td></tr>
<tr><td>ii) Calculate the correlation coefficient for the following data:
<table>
<tr><td>X</td><td>22</td><td>26</td><td>29</td><td>30</td><td>31</td><td>31</td><td>34</td><td>35</td></tr>
<tr><td>y</td><td>20</td><td>20</td><td>21</td><td>29</td><td>27</td><td>24</td><td>27</td><td>31</td></tr>
</table></td><td>4</td><td>2</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>i) Given the bi-variable data:
<table>
<tr><td>X:</td><td>1</td><td>5</td><td>3</td><td>2</td><td>1</td><td>1</td><td>7</td><td>3</td></tr>
<tr><td>Y:</td><td>6</td><td>1</td><td>0</td><td>0</td><td>1</td><td>2</td><td>1</td><td>5</td></tr>
</table>
(a)Find the Regression line of Y on X and hence predict Y if X=10
(b)Fit a Regression line of X on Y and hence predict X if Y=2.5.</td><td>3</td><td>2</td><td>7M</td></tr>
<tr><td>ii) Obtain the rank correlation coefficient for the heights of Father's and their sons the following data.</td><td>4</td><td>2</td><td>7M</td></tr>
</table>

Fathers	65	63	67	64	68	62	70	66	68	67	69	71
Sons	68	66	68	65	69	66	68	65	71	67	68	70

Unit-III

3	a	i) Suppose three companies X, Y, Z produce T.V's X produce twice as many as Y while Y and z produce the same number. It is known that 2% of X, 2% of Y and 4% of y are defective. All the T.V's produced and put into one shop and then one T.V. is chosen at random. (a)What is the probability that the TV is defective? (b)Suppose the TV chosen is defective. What is the probability that this TV is produced by company X?	3	3	7M
		ii) A problem of statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2},\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved?	2	3	7M
		OR			
	b	i) In a normal distribution, 7% of the items are under 35 and 89% are under 63. Determine the mean and variance of the distribution.	4	3	7M
		ii) A random variable X has the following probability function Find (a) K (b) Mean (c) Variance	3	3	7M

X	-3	-2	-1	0	1	2	3
P(X)	K	0.1	K	0.2	2k	0.4	2k

Unit-IV

4	a	i) A random sample of size 144 is taken from an infinite population having mean $\mu = 75, \sigma^2 = 225$. What is the probability that $\bar{x}$ will lies between 72 and 77.	2	4	7M
		ii) A normal population has a mean of 0.1 and standard deviation 2.1. Find the probability that mean of a sample of size 900 will be negative.	3	4	7M
		OR			
	b	i) : It is desired to estimate the mean number of hours of continuous use until a certain computer will first require repairs. If it can be assumed that σ = 48 hours, how large a sample be needed so that one will be able to assert with 90% confidence that the sample mean is off by at most 10 hours.	3	4	7M
		ii) The mean and the standard deviation of a population are 11.795 and 14.054 respectively. If n = 50, find 95% confidence interval for the mean.	3	4	7M

Unit-V

5	a	i) The average marks scored by 32 boys is 72 with a S.D. of 8. While that for 36 girls is 70 with a S.D. of 6. Does this indicate that the boys perform better than girls at level of significance 0.05?	3	5	7M
		ii) In a sample of 500 from a village in Rajasthan, 280 are found to be wheat	3	5	7M

<table>
<tr><td rowspan="4"></td><td></td><td>eaters and the rest rice eaters. Can we assume that the both articles are equally popular.</td><td></td><td></td><td></td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>i) : Two horses A and B were tested according to the time (in seconds) to run a particular track with the following results.<table><tr><td>Horse A</td><td>28</td><td>30</td><td>32</td><td>33</td><td>33</td><td>29</td><td>34</td></tr><tr><td>Horse B</td><td>29</td><td>30</td><td>30</td><td>24</td><td>27</td><td>29</td><td>--</td></tr></table>Test whether the two horses have the same running capacity.</td><td>5</td><td>5</td><td>7M</td></tr>
<tr><td>ii) Pumpkins were grown under two experimental conditions. Two random samples of 11 and 9 pumpkins, show the sample standard deviations of their weights as 0.8 and 0.5 respectively. Assuming that the weight distributions are normal, test hypothesis that the true variances are equal.</td><td>5</td><td>5</td><td>7M</td></tr>
</table>

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

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NARASARAOPETA
NEC ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CE2102

II B.Tech. - I Semester Supple Examinations, October-2025
FLUID MECHANICS
(CE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
1		**Unit-I**			
	a	(i) Enunciate Newton's law. Of viscosity. Explain the importance of viscosity in fluid motion. What is the effect of temperature on viscosity of water and that of air?	K2	1	7M
		(ii) The dynamic viscosity of an oil, used for lubrication between a shaft and sleeve is 6 poise. The shaft is of diameter 0.4m and rotates at 190 r.p.m. calculate the power lost in the bearing for a sleeve length of 90 mm. the thickness of the oil film is 1.5 mm.	K3	1	7M
		OR			
	b	(i) Define the terms: Density, specific volume, specific gravity, Vacuum Pressure, Compressible fluid and incompressible fluid.	K2	1	7M
		(ii) A U- tube manometer is used to measure the pressure of water in pipe line, which is in excess of atmospheric pressure. The right limb of the manometer contains mercury and is open to atmosphere. The contact between water and mercury is in the left limb. Determine the pressure of water in the main line, if the difference in level of mercury in the limb of U-tube is 10 cm and the free surface of mercury is in level with the centre of the pipe. If the pressure of water in pipeline is reduced to 9810 N/m^2, calculate the new difference in the level of mercury, sketch the arrangements of both cases.	K4	1	7M
2		**Unit-II**			
	a	(i) Define the terms: Laminar flow, steady flow, Non-uniform flow, two dimensional flow.	K2	2	7M
		(ii) A 30 cm diameter pipe, conveying water, branches into two pipes of diameters 20 cm and 15 cm respectively. If the average velocity in the 30 cm diameter pipe is 2.5 m/s, find the discharge in this pipe. Also determine the velocity in 15 cm pipe if the average velocity in 20 cm diameter pipe is 2 m/s.	K4	2	7M
		OR			
	b	If for a two dimensional potential flow, the velocity potential is given by $\phi = x\ (2y - 1)$ determine the velocity at the point P (4, 5). Determine also the value of stream function ψ at the point P.	K4	2	14M
3		**Unit-III**			
	a	The water is flowing through a pipe having diameters 20 cm and 10 cm sections. 1 and 2 respectively. The rate of flow through pipe is 35 liters /s. the section 1 is 6 m above datum and section 2 is 4 m above datum. If the pressure at section 1 is 39.24 N/cm^2, find the intensity of pressure at section 2.	K4	3	14M
		OR			
	b	(i) Derive Bernoullis's equation for the flow of an incompressible frictionless fluid from consideration of momentum.	K2	3	7M

		(ii) A horizontal venturimeter with inlet and throat diameters 30 cm and 15 cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 20 cm of mercury. Determine the rate of flow.	K3	3	7M
4		**Unit-IV**			
	a	(i) Define the following co-efficients: Co-efficient of velocity, Co-efficient of contraction and Co-efficient of discharge.	K2	4	7M
		(ii) The head of water over an orifice of diameter 100 mm is 10 m. the water coming out from orifice is collected in a circular tank of diameter 1.5 m. the rise of water level in this tank is 1.0 m in 25 seconds. Also the coordinates of a point on the jet, measured from vena-contracta are 4.3 m horizontal and 0.5 m vertical/ find the co-efficient, C_d, C_v and C_C.	K4	4	7M
		OR			
	b	(i) Distinguish between (A) External mouthpiece and internal mouthpiece, (B) Mouthpiece running free and mouthpiece running full.	K2	4	7M
		(ii) A right angled V-notch is used for measuring a discharge of 30 litres/s. An error of 1.5 mm was made while measuring the head over the notch. Calculate the percentage error in the discharge, Take $C_d = 0.62$.	K4	4	7M
5		**Unit-V**			
	a	(i) Derive an expression for the loss of head due to (A) sudden enlargement (B) sudden contraction of a pipe.	K3	5	7M
		(ii) Find the head lost due to friction in a pipe of diameter 300 mm and length 50 m, through which water at a velocity of 3 m/s using (i) Darcy formula (ii) Chey's formula for which C =60. Take viscosity for water is 0.01 stoke.	K4	5	7M
		OR			
	b	For turbulent flow in a pipe of diameter 300 mm, find the discharge when the centre line velocity is 2.0 m/s. and the velocity at a point 100 mm from the centre as measured by pitot-tube is 1.6 m/s.	K4		14M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA
NEC ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CE2103

II B.Tech. - I Semester Supple Examinations, October-2025
STRENGTH OF MATERIALS-I
(CE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	A rectangular plate made of steel is 4 m long and 20 mm thick and is subjected to an axial tensile load of 60 kN. The width of the plate varies from 30 mm at one end to 80 mm at the other end. Find the elongation, if E = 2x105 N/mm2.	K3	CO1	7M
		Deduce the relation between the Modulus of Elasticity and Modulus of Rigidity.	K2	CO1	7M
		OR			
	b	State Hooks Law and define Poisson's Ration	K2	CO1	7M
		Derive the RelationShip between Three Elastic Constants	K2	CO1	7M
2		**Unit-II**			
	a	A simply supported beam of length 7 m rests on supports 6 m apart, the right hand end is overhanging by 2.5 m. The beam carries a uniformly distributed load of 1600N/m over the entire length. Draw S.F. and B.M diagrams and find the point of contra flexure, if any	K3	CO2	14M
		OR			
	b	A simply supported beam of span 10 m carries point loads 5kN each at distance of 2 m and 6 m from left support and also a uniformly distributed load of 4kN/m between the two point loads. Draw the S.F and B.M diagrams for the beam.	K4	CO2	10M
		Derive the Relation Ship between SF, BM and rate of loading	K2	CO2	4M
3		**Unit-III**			
	a	A timber cantilever 250 mm wide and 350 mm deep is 3.5 m long. It is loaded with a U.D.L of 4kN/m over the entire length. A point load of 2.7 kN is placed at the free end of the cantilever. Find the maximum bending stress produced.	K3	CO3	7M
		State the assumptions. made in delivering bending equation	K1	CO3	7M
		OR			
	b	Derive the stress distribution for circular section & plot shear stress distribution.	K4	CO3	14M
4		**Unit-IV**			
	a	Write the steps involved in Macaulay's Method	K2	CO4	7M
		Write the limitations of the moment area method	K2	CO4	7M
		OR			
	b	Find the expression for the slope and deflection of a cantilever of length L which carries a uniformly distributed load over a length 'a' from the fixed end by Double integration method.	K3	CO4	14M

5	**Unit-V**				
	a	A steel cylinder of 300 mm external diameter is to be shrunk to another steel cylinder of 150 mm internal diameter. After shrinking the diameter at the junction is 250 mm and radial pressure at the common junction is 28 N/mm2. Find the original difference in radii at the junction. Take E = 2 × 105 N/mm2.	K3	CO5	14M
	OR				
	b	Explain about longitudinal and Volumetric Strains?	K2	CO5	7M
		A thin cylindrical shell of 1m diameter is subjected to an internal pressure of 1N/mm2. Calculate the suitable thickness of the shell, if the tensile strength of the plate is 400N/mm2 and factor of safety is 4	K4	CO5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CE2104

II B.Tech. - I Semester Supple Examinations, October-2025

SURVEYING AND GEOMATICS

(CE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

<table>
<tr><th>QNo</th><th></th><th>Questions</th><th>KL</th><th>CO</th><th>Marks</th></tr>
<tr><td rowspan="5">1</td><td colspan="5">Unit-I</td></tr>
<tr><td>a</td><td>The following are the bearings observed in traversing with a compass in an area where local attraction was suspected. Calculate the interior angles of the traverse and correct them if necessary.
<table>
<tr><th>Line</th><th>FB</th><th>BB</th></tr>
<tr><td>AB</td><td>150°0′</td><td>330°0′</td></tr>
<tr><td>BC</td><td>230°30′</td><td>48°0′</td></tr>
<tr><td>CD</td><td>306°15′</td><td>127°45′</td></tr>
<tr><td>DE</td><td>298°0′</td><td>120°0′</td></tr>
<tr><td>EA</td><td>49°30′</td><td>229°30′</td></tr>
</table></td><td>K3</td><td>CO1</td><td>14M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>A 20 m chain was found to b e 15cm too long after chaining a distance of 1600m.It was found to be 30cm too long at the end of the day's work after chaining a total distance of 3200m. Determine the correct distance if the chain was correct before the commencement of the work</td><td>K2</td><td>CO1</td><td>7M</td></tr>
<tr><td>Give the Broad Classification of Surveying</td><td>K3</td><td>CO1</td><td>7M</td></tr>
<tr><td rowspan="5">2</td><td colspan="5">Unit-II</td></tr>
<tr><td>a</td><td>The following consecutive readings were taken with a dumpy level and 4m levelling staff on a continuously sloping ground at 30m intervals.
0.680, 1.455, 1.855, 2.330, 2.885, 3.380, 1.055, 1.860, 2.265, 3.540, 0.835, 0.945, 1.530 and 2.250. R.L of the starting point was 80.750m.
i. Rule out a page of a level book and enter the above readings.
ii. Determine the RL of various staff stations.</td><td>K3</td><td>CO2</td><td>14 M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>Differentiate between Permanent and temporary adjustments of level</td><td>K3</td><td>CO2</td><td>7M</td></tr>
<tr><td>Discuss the Effects of Curvature and refraction in levelling</td><td>K2</td><td>CO2</td><td>7M</td></tr>
<tr><td rowspan="5">3</td><td colspan="5">Unit-III</td></tr>
<tr><td rowspan="2">a</td><td>i) Describe the measurement of horizontal angle by repetition method. What are the errors eliminated by repetition method?</td><td>K2</td><td>CO1</td><td>7M</td></tr>
<tr><td>ii) With neat sketches, explain the method of intersection in plane tabling?</td><td>K2</td><td>CO3</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td>b</td><td>i) The following are the corrected consecutive coordinates of a closed traverse ABCDEA. Calculate the independent coordinates. Assume that the independent coordinates of A are (500N. 0E).
<table>
<tr><th rowspan="2">Line</th><th colspan="2">Latitude</th><th colspan="2">Departure</th></tr>
<tr><th>N</th><th>S</th><th>E</th><th>W</th></tr>
</table></td><td>K3</td><td>CO3</td><td>7M</td></tr>
</table>

<table>
<tr><td></td><td></td><td>
<table>
<tr><td>AB</td><td></td><td>365.30</td><td>626.30</td><td></td></tr>
<tr><td>BC</td><td>489.60</td><td></td><td>940.40</td><td></td></tr>
<tr><td>CD</td><td>990.60</td><td></td><td></td><td>762.70</td></tr>
<tr><td>DE</td><td></td><td>538.30</td><td></td><td>777.00</td></tr>
<tr><td>EA</td><td></td><td>576.60</td><td></td><td>27.00</td></tr>
</table>
</td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td>ii)Describe the temporary Adjustments of theodolite</td><td>K2</td><td>CO3</td><td>7M</td></tr>
<tr><td rowspan="6">4</td><td colspan="5">Unit-IV</td></tr>
<tr><td rowspan="2">a</td><td>i) Discuss the Difference Between tangential and stadia tacheometry</td><td>K2</td><td>CO4</td><td>7M</td></tr>
<tr><td>ii) A tacheometer is setup at an intermediate point on a traverse PQ. The following observations are made on the vertically held staff.
<table>
<tr><td>Staff station</td><td>Vertical Angle</td><td>Staff intercept</td><td>Axial Hair readings</td></tr>
<tr><td>P</td><td>8°36′</td><td>2.350</td><td>2.105</td></tr>
<tr><td>Q</td><td>6°6′</td><td>2.055</td><td>1.895</td></tr>
</table>
The instrument was fitted with an an allactic lens and having constant 100. Compute the length of PQ and RL of Q. RL of P is 321.50m.</td><td>K4</td><td>CO4</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>Define Total station surveying? Describe its working principle with neat sketches. Mention its advantages and applications</td><td>K2</td><td>CO4</td><td>7M</td></tr>
<tr><td>ii) Explain the advantages and disadvantages of Total station?</td><td>K2</td><td>C04</td><td>7M</td></tr>
<tr><td rowspan="6">5</td><td colspan="5">Unit-V</td></tr>
<tr><td rowspan="2">a</td><td>i)What is overlap in aerial photography? Explain the different types of overlaps and its uses?</td><td>K2</td><td>CO5</td><td>7M</td></tr>
<tr><td>ii)The scale of an aerial photograph is 1cm= 160m and the size of the photograph is 20cmx20cm. If the longitudinal lap is 65% and side lap is 35%, determine the number of photographs required to cover an area of 233sq.km.</td><td>K3</td><td>CO5</td><td>7M</td></tr>
<tr><td colspan="5">OR</td></tr>
<tr><td rowspan="2">b</td><td>What is the Principle of stereoscopy? Elaborate in detail</td><td>K2</td><td>CO5</td><td>7M</td></tr>
<tr><td>Discuss in Detail about the Practical Applications of terrestrial photogrammetry</td><td>K2</td><td>CO5</td><td>7M</td></tr>
</table>

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CE2105

II B.Tech. - I Semester Supple Examinations, October-2025

CONCRETE TECHNOLOGY

(CE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
		Unit-I			
1	a	Discuss the phenomena of hydration of cement. How is the water-cement ratio related to strength?	K2	1	7M
		Describe the manufacturing process of ordinary Portland cement by dry process	K2	1	7M
		OR			
	b	What are the raw materials required in the manufacturing of cement? Mention their function in the properties of cement.	K2	1	7M
		Describe the procedure for determining the fineness of cement using a standard sieve.	K2	1	7M
		Unit-II			
2	a	Explain the factors affecting the workability of concrete.	K2	2	7M
		How do you select a good aggregate and what are the factors to be examined during their selection?	K3	2	7M
		OR			
	b	Define gradation and explain the importance of grading of aggregates. What is bulking of fine aggregate and how is it taken care of in the field?	K3	2	14M
		Unit-III			
3	a	Explain in detail about surface acting admixtures	K2	3	7M
		Write short notes on different types of chemical admixtures used in concrete	K3	3	7M
		OR			
	b	What are the benefits of using plasticizers and Super plasticizers in concrete?	K3	3	7M
		What is the purpose of using accelerators in concrete? Describe the mechanism of action of accelerators.	K2	3	7M
		Unit-IV			
4	a	What is durability of concrete? Mention the factors affecting durability of concrete	K2	4	7M
		Explain the relation between compression and tensile strength of concrete.	K2	4	7M
		OR			
	b	Explain any two non-destructive methods of testing concrete	K2	4	7M
		Identify the relation between modulus of elasticity and strength	K3	4	7M
		Unit-V			
5	a	Explain the factors affecting the Fiber Reinforced Concrete	K2	5	7M
		Write the procedure of Mix Design with reference to the provisions laid in IS -10262-2009.	K3	5	7M
		OR			
	b	What is light weight concrete? How is it produced?	K3	5	7M

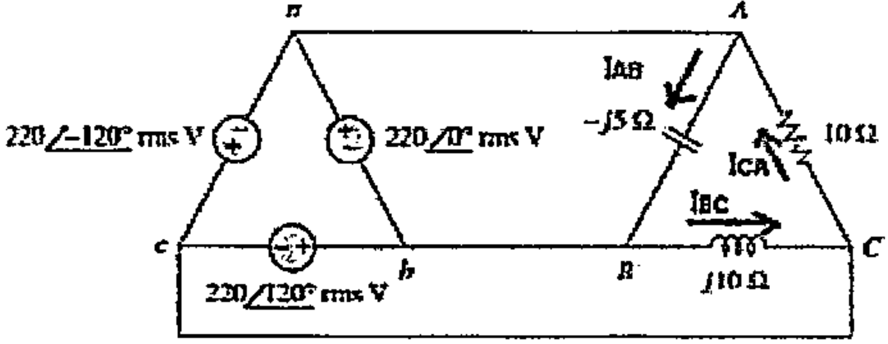
NEC. NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

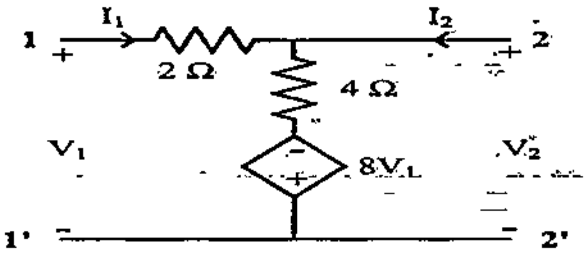
Subject Code: R20EE2102

II B.Tech. - I Semester Supple Examinations, October-2025
ELECTRICAL CIRCUIT ANALYSIS-II
(EEE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All FIVE Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
		Unit-I			
1	a	(i)A balanced star connected load having an impedance (15+j20) ohm per phase is connected to a three phase, 440 V, 50 Hz supply. Find the line currents and the power absorbed by the load. Assume RYB phase sequence.	K2	1	7M
		(ii)Explain about the concept of three phase three wire supply connected to balanced delta connected load with an example.	K2	1	7M
		OR			
	b	(i) Derive line and phase current relation in star connection with phasor diagram and also derive real and reactive powers	K2	1	7M
		(ii)List the advantages of three phase system over single phase and list the 3 phase applications.	K2	1	7M
		Unit-II			
2	a	 (i) Find the currents of given circuit.	K3	2	7M
		(ii) Derive an expression for power factor by using two wattmeter reading.	K2	2	7M
		OR			
	b	The two wattmeter method produces wattmeter readings 1560W and 2100W when connected to a delta connected load. If the line voltage is 220V, calculate (i) the per phase average power (ii) the per phase reactive power (iii) power factor (iv) the phase impedance.	K2	2	14M
		Unit-III			
3	a	(i) Derive transient response of series RL circuit under DC excitation by using differential method.	K2	3	7M
		(ii) A resistance of 100 ohms and a capacitance of 25 μ F are connected in series across a 1000 sin (500t) voltage source. There is no initial charge on capacitor. Find the expression for current in the circuit.	K2	3	7M
		OR			
	b	(i) A 5 ohms resistance and 20 H inductance are connected in series across a battery. At the instant of closing the switch, the current increases at the rate of 4 A/sec. Find (a) supply voltage (b) rate of growth of current when 5 A flow in the circuit (c) energy stored under both conditions.	K3	3	7M

		(ii) Derive transient response of series RC circuit under AC excitation by using laplace domain method.	K2	3	7M
4		**Unit-IV**			
	a	(i) Determine Z_{12}, Y_{22}, C and H_{21} parameters of the given network.  	K3	4	7M
		(ii) Derive an interconnection of two networks which are connected in parallel.	K2	4	7M
		OR			
	b	(i) Derive reciprocity and symmetry conditions in Z parameters.	K2	4	7M
		(ii) Express ABCD parameters in terms of hybrid parameters.	K2	4	7M
5		**Unit-V**			
	a	(i)List in detail about properties of LC immittance functions	K2	5	7M
		(ii)Construct the circuit diagram of following LC impedance using foster1st form $$Z_{LC}(s) = \frac{4(s^2+1)(s^2+16)}{s(s^2+4)}$$	K3	5	7M
		OR			
	b	(i)Explain with an example about LC immittance function in RC impedance and RL admittance.	K2	5	7M
		(ii) Construct the circuit diagram of the following impedance using cauer form method. $Z=\frac{(S+4)(S+6)}{(S+3)(S+5)}$	K2	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20EE2103

II B.Tech. - I Semester Supple Examinations, October-2025

ELECTRICAL MACHINES-I

(EEE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	What is armature reaction in a DC machine? How does it affect commutation? What steps are taken to have effective commutation?	K L3	CO1	7M
		A 250V, 14.9KW, 8 pole dc motor has single turn coil. The armature is wave wound with 93 commutator segments. If the brushes are shifted by 2 commutator segments at full full load, calculate (i) total armature reaction ampere-turns. (ii) demagnetizing ampere-turns (iii) cross magnetizing ampere-turns. Assume motor efficiency to be 80%.	K L2	CO1	7M
		OR			
	b	Sketch the load characteristics of: (i) dc shunt and (ii) dc series generator. give reasons for the particular shape in each case.	K L1	CO1	5M
		A 2 pole dc shunt generator charges a 100V battery of negligible internal resistance. The armature of the machine is made of 2000 conductors, each of 4mΩ resistance. The charging currents are found to be 10A and 20A for generator speed of 1055 and 1105 rpm respectively. Find shunt field resistance and flux per pole of the generator. Neglect armature reaction.	K L4	CO1	9M
2		**Unit-II**			
	a	Derive an expression of back emf and torque in dc machine. Also mention the significance of back emf in dc machine.	K L2	CO2	9M
		A dc shunt motor draws an armature current of 12A from a 220V dc supply when developing a gross torque of 20N-M in the armature running at 1200rom. What will be the induced back emf in the armature?	K L3	CO2	5M
		OR			
	b	What are the various losses occurring in rotating machine? Mention the methods to reduce them also derive efficiency equation of a dc motor.	K L1	CO2	7M
		Draw the following characteristics of dc series motor (i)Armature current vs speed (ii) torque vs speed Also write applications of these motors.	K L4	CO2	7M
3		**Unit-III**			
	a	What are the different speed control methods of DC shunt motor? Explain each method and enumerate advantages and disadvantages?	K L3	CO3	7M
		A 220V dc shunt motor having an armature resistance of 0.25Ω carries an armature current of 50A and runs at 600 r.p.m. if the flux is reduced by 10% by field regulator, find the speed assuming torque remain same	K L2	CO3	7M
		OR			
	b	write clearly about Swinburne's test with neat circuit diagram	K L1	CO3	7M
		A 100 kw, 460 V shunt generator is running as motor on no load at its rated voltage and speed. The total current taken was 9.8 A including a shunt current of 2.7A. the resistance of armature circuit was 0.11Ω. calculate the efficiency	K L5	CO3	7M

		at (i) full load (ii) half full load			
4	Unit-IV				
	a	Draw and explain the phasor diagrams of a transformer on load. How it effects the power factor of the loaded transformer.	K L3	CO4	7M
		A single phase transformer takes 10A on no-load at power factor of 0.2 lagging. The turns ratio is 4:1. If the load on secondary is 200A at a power factor of 0.85 lagging. Find primary current and power factor. Neglect voltage drop in the winding.	K L2	CO4	7M
	OR				
	b	What are the losses in transformer? Write an expression for calculating the efficiency of transformer. Develop condition for maximum efficiency.	K L3	CO4	7M
		Describe sumpner's test used for transformer. Indicate its advantages.	K L1	CO4	7M
5	Unit-V				
	a	What is Scott connection and explain how phase conversion is carried out?	K L1	CO5	7M
		What are the necessary conditions for parallel operation of transformer? How the load is shared between them having equal voltage ratio	K L2	CO5	7M
	OR				
	b	Briefly explain no load and on load tap changing of transformer with neat diagrams.	K L4	CO5	9M
		Write short notes on cooling methods of transformer?	K L2	CO5	5M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA
NEC ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20EE2104

II B.Tech. - I Semester Supple Examinations, October-2025
ELECTROMAGNETIC FIELDS
(EEE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
		Unit-I			
1	a	(i)State and explain the Coulomb's law	**K2**	**1**	**7M**
		(ii)Point charges 5 nC and -2nC are located at (2,0,4) and (-3,0,5) respectively. Determine the force on a 1 nC point charge located at (1,-3,7)	**K5**	**1**	**7M**
		OR			
	b	(i)Calculate the volume of a sphere of radius R using integration.	**K3**	**1**	**7M**
		(ii)Find the laplacian scalar field and comment the which field are harmonic $w=x^2+xyz-yz^2$ and $2r\cos\theta\ \cos\varphi$	**K5**	**1**	**7M**
		Unit-II			
2	a	(i)State and prove the Gauss's law	**K2**	**2**	**7M**
		(ii)Three equal charges of 1μC are placed at the corner of square of length 10cm. find the direction and magnitude of electric field intensity at vacant corner.	**K5**	**2**	**7M**
		OR			
	b	Obtain the boundary conditions between two perfect dielectrics and Deduce the expression for continuity equation	**K3**	**2**	**14M**
		Unit-III			
3	a	(i)Derive an expression for static Magnetic field intensity due to infinite long straight conductor.	**K4**	**3**	**7M**
		(ii)State the Ampere's circuital law	**K2**	**3**	**7M**
		OR			
	b	(i)Obtain the equation of Magnetic moment	**K3**	**3**	**7M**
		(ii)Explain about the scalar and vector potentials of magnetic field?	**K2**	**3**	**7M**
		Unit-IV			
4	a	(i)Obtain the equation of energy density in a magnetic field	**K3**	**3**	**7M**
		(ii)Discuss about force between differential current elements		**3**	**7M**
		OR			
	b	(i)Express the equation of mutual inductance between a straight long wire and a square loop wire in the same plane	**K3**	**4**	**7M**
		(ii)A solenoid of 10 cm in length consists of 1000 turns having the cross-sectional radius of 1cm.find the inductance of the solenoid. What is the value of the current required to maintain a flux of 1mWb in the solenoid? Take $\mu_r=1500$	**K5**	**4**	**7M**

5	**Unit-V**				
	a	(i)Describe the Pointing theorem and derive its necessary expression.	**K2**	**5**	**7M**
		(ii)Derive an expression for general wave equations	**K3**	**5**	**7M**
	OR				
	b	(i)State and prove Pointing theorem	**K2**	**5**	**7M**
		(ii)Write Maxwell's equations for static fields. Explain how they are modified for time varying electric and magnetic fields.	**K2**	**5**	**7M**

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject code: R20EE2105

II B.Tech. - I Semester Supple Examinations, October-2025
ANALOG ELECTRONICS
(EEE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
		Unit-I			
1	a	i) Derive the general expression for gain with negative feedback and discuss its impact on amplifier characteristics.	K3	1	7M
		ii) Explain the classification of amplifiers (Voltage, Current, Transconductance, and Transresistance) and compare their characteristics.	K2	1	7M
		OR			
	b	i) Analyze the input and output resistance of a Voltage Series Feedback Amplifier.	K3	1	7M
		ii) Compare Negative and Positive Feedback in amplifiers with examples and applications.	K2	1	7M
		Unit-II			
2	a	i) Derive and analyze the step response of an RC High-Pass Filter.	K3	2	7M
		ii) Explain the operation of a diode parallel clipper circuit with different input waveforms.	K2	2	7M
		OR			
	b	i) Design and explain a two-level clipping circuit using diodes and justify its applications. ii) Explain how an RC circuit acts as an Integrator and Differentiator.	K3, K2	2	7M+7 M
		Unit-III			
3	a	i) Explain the DC and AC characteristics of an operational amplifier and discuss the impact of input offset voltage and bias currents. ii) A capacitor (C = 0.01 μF) and a resistor (R = 100 kΩ) are used to design an op-amp integrator. Derive the output voltage expression if an input step voltage of 5V is applied. Find the output voltage at t = 2 ms.	K 2	3	10+4M
		OR			
	b	Derive the expression for Voltage-to-Current (V-I) and Current-to-Voltage (I-V) conversion circuits using an op-amp	K3	3	14M
		Unit-IV			
4	a	i) Explain the functional block diagram of a 555 Timer and analyze its monostable operation with necessary derivations. ii) A monostable multivibrator using an op-amp has an RC time constant of 2 ms. Find the duration of the output pulse if triggered by a 20 μs pulse.	K2	4	10+4M
		OR			
	b	Explain the working principle of an Astable Multivibrator using an Op-Amp. Derive expressions for its frequency and duty cycle.	K3	4	14M

5	Unit-V				
	a	i) Design a first-order High-Pass Active Filter and derive its frequency response characteristics.	K3	5	7M
		ii) Explain the working of an R-2R Ladder DAC with a neat circuit diagram.	K2	5	7M
	OR				
	b	i) Compare different types of ADCs and explain the working of a Parallel Comparator ADC.	K4	5	7M
		ii) Explain the working principle of a Dual Slope ADC and discuss its advantages.	K2	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20ME2102

II B.Tech. - I Semester Supple Examinations, October-2025
FLUID MECHANICS AND HYDRAULIC MACHINERY
(ME)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

Q No.		Questions	KL	CO	Marks
1		**Unit-I**			
	a	i) Define viscosity. A plate having an area of 0.7 m^2 is sliding down the inclined plane at 45^0 to the horizontal with a velocity of 0.45 m/s. there is a cushion of fluid 2 mm thick between the plane and the plate. Find the viscosity of the fluid if the weight of the plate is 300N.	K5	01	8M
		ii) Describe the differential manometer with neat sketch.	K3	01	6M
		OR			
	b	i)A fan delivers 4 m^3 of air per second at 20^0C and 1.25 bar. Assuming molecular weight of air as 28.97, calculate the mass of air delivered. Also determine the density, specific volume and specific weight of the air being delivered.	K5	01	8M
		ii) Differentiate between: a) Absolute pressure and gauge pressure b) Piezometer and simple manometer c) U-tube differential manometer and inverted U-tube differential manometer.	K3	01	6M
2		**Unit-II**			
	a	i) Explain (i) Stream line (ii) vorticity (iii) Irrotational Flow and (iv) Streak line.	K4	02	8M
		ii) State and explain continuity equation. Derive continuity equation for one dimensional flow.	K3	02	6M
		OR			
	b	Derive Euler's Equation of Motion? How will you obtain Bernoulli's equation from it?	K5	02	14M
3		**Unit-III**			
	a	i) A thin plate is moving in still atmospheric air at a velocity of 5 m/sec. The length of the plate is 0.6m and width 0.5m. Calculate the thickness of boundary layer at the end of the plate. Take density of air as 1.25 kg/m^3 and kinematic viscosity is 0.15 stokes.	K3	03	6M
		ii) Explain in detail laminar boundary layer, turbulent boundary layer, laminar sub-layer.	K4	03	8M
		OR			
	b	i) Explain with sketches the three methods of boundary layer control.	K4	03	8M
		ii) Define & explain i) Froude's number ii) Mach number and iii) Model similarities.	K3	03	6M
4		**Unit-IV**			

	a	i) Derive an expression of the force exerted by a jet of water on moving inclined plane in the direction of the jet.	K4	04	7M
		ii) Show that for the maximum efficiency, the bucket speed of a pelton wheel should be equal to one half of the jet speed.	K3	04	7M
	OR				
	b	i) What is the importance of a draft tube in a Francis turbine? Discuss different types of draft tubes.	K3	04	6M
		ii) A hydraulic turbine under a head of 25 metres develops 7260 kW running at 110 rpm. What is the specific speed of the turbine? What type of turbine is this? Find also the normal speed and output if the head on the turbine is reduced to 20 metres.	K4	04	8M
5	**Unit-V**				
	a	i) Explain the constructional features of the Reciprocating pump with neat sketch.	K3	05	6M
		ii) A centrifugal pump is to discharge 0.118 m3 /s at a speed of 1450 r.p.m. against a head of 25 m. The impeller diameter is 250 mm, its width at outlet is 50 mm and manometric efficiency is 75%. Determine the vane angle at the outer periphery of the impeller.	K4	05	8M
	OR				
	b	i) Explain various types of impellers used in centrifugal pump.	K3	05	6M
		ii) The cylinder bore diameter of a single acting reciprocating pump is 150 mm and its stroke length is 300 mm. The pump runs at 50 rpm and lifts water through a height of 25m. The delivery pipe is 22 m long and 100 mm in diameter. Find the theoretical discharge. If the actual discharge is 4.2 litres/s, find the % Slip.	K4	05	8M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20ME2103

II B.Tech. - I Semester Supple Examinations, October-2025
METROLOGY AND INSTRUMENTATION
(ME)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
		Unit-I			
1	a	Explain the terms precision, accuracy, repeatability and sensitivity.	K3	01	7M
		Explain different types of fits with sketches	K5	01	7M
		OR			
	b	With neat sketches discuss about the hole and shaft basis systems.	K3	01	7M
		Distinguish between Unilateral and bilateral tolerance system with an example	K2	01	7M
		Unit-II			
2	a	With a neat sketch explain the constructional features and working of an optical bevel protractor.	K3	02	7M
		What are the limitations of a sin bar in measuring the angles? Justify.	K1	02	7M
		OR			
	b	List and describe various grades of slip gauges. Also outline the procedure for manufacturing the slip gauges.	K5	02	14M
		Unit-III			
3	a	Explain the working of Tool makers Microscope with a neat sketch.	K3	03	7M
		What are Profile gauges. Discuss about the types of profile gauges.	K2	03	7M
		OR			
	b	Explain with sketch the measurement of straightness error using autocollimator	K3	03	7M
		What is a Laser sensor? Mention some applications of laser sensors.	K1	03	7M
		Unit-IV			
4	a	Discuss the terms Static and dynamic response.	K1	04	7M
		What are the errors in measuring instruments, and what are the sources of errors.	K2	04	7M
		OR			
	b	Explain the Principle and working of LVDT with a neat sketch.	K3	04	7M
		Differentiate piezo electric and capacitance transducers.	K2	04	7M
		Unit-V			
5	a	Differentiate between Thermistor and thermo couple.	K2	05	7M
		With a neat sketch explain the working of a Thermocouple.	K3	05	7M
		OR			
	b	Explain the principle and working of McLeod pressure gauge and also mention its	K3	05	7M

		advantages.			
		What is a Manometer. Mention some advantages, disadvantages and applications of manometers.	K2	05	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20ME2104

II B.Tech. - I Semester Supple Examinations, October-2025
THERMODYNAMICS
(ME)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	Show that heat is a path function and not a property.	**K2**	**01**	**5M**
		A balloon is filled with air (200kPa/300K) such that it becomes a sphere of diameter 1m. It is then gradually heated till its pressure rises to 500kPa. Determine the amount of work done during the process, assuming that the pressure inside the balloon is proportional to the diameter of the balloon.	**K3**	**01**	**9M**
		OR			
	b	An open system defined for a fixed region and a control volume are synonymous. Explain.	**K2**	**01**	**5M**
		If a gas of volume 6000 cm^3 and at pressure of 100 kPa is compressed quasi-statically according to $p v^2$=constant until the volume becomes 2000 cm^3, determine the final pressure and the work transfer.	**K3**	**01**	**9M**
2		**Unit-II**			
	a	State the first law for a closed system undergoing a change of state.	**K2**	**02**	**5M**
		A certain water heater operates under steady flow conditions receiving 4.2kg/s of water at 75^{0}C temperature, enthalpy 313.93kJ/kg. The water is heated by mixing with steam which is supplied to the heater at temperature 100.2^{0}C and enthalpy 2676kJ/kg. The mixture leaves the heater as liquid water at temperature 100^{0}C and enthalpy 419kJ/kg. How much steam must be supplied to the heater per hour?	**K3**	**02**	**9M**
		OR			
	b	Discuss the limitations of first law of thermodynamics.	**K2**	**02**	**5M**
		Derive Steady Flow Energy equations applied to flow systems.	**K3**	**02**	**9M**
3		**Unit-III**			
	a	What is a heat pump? How does it differ from a refrigerator?	**K2**	**03**	**5M**
		Establish the equivalence of Kelvin-Planck and Clausius statements.	**K2**	**03**	**9M**
		OR			
	b	What do you understand by the entropy principle? Discuss.	**K2**	**03**	**5M**
		To produce network in a thermodynamic cycle, a heat engine has to exchange heat with two thermal reservoirs. Explain.	**K3**	**03**	**9M**
4		**Unit-IV**			
	a	Explain Daltons Law of Partial Pressures.	**K2**	**04**	**5M**
		Draw the phase equilibrium diagram for a pure substance on $p-T$ coordinates. Explain.	**K2**	**04**	**9M**
		OR			
		Explain Avogadro's Law of additives.	**K2**	**04**	**5M**

	b	10kg of water at 45^0C is heated at constant pressure of 10 bar until it becomes superheated vapour at 300^0C. Find the change in volume, enthalpy, energy and entropy.	K3	04	5M
	Unit-V				
5	a	An ideal diesel engine operates within the temperature limits of 1700K and 300K and with a compression ratio of 16. Determine the i) pressure and temperature at each point in the cycle, ii) thermal efficiency of the cycle, iii) work ratio and iv) MEP.	K3	05	14M
	OR				
	b	A refrigerator operates in an ideal vapour compression refrigeration cycle between the pressure limits of 140kPa and 800kPa. The circulation rate of the refrigerant is $180kgh^{-1}$. Determine the i) rate of heat removal from the refrigerated space, ii) power input to the compressor, iii) COP of the machine. What would happen if the throttle valve were replaced by an expansion turbine (the specific enthalpy of the refrigerant at the turbine exit would be 86.92 kJ kg^{-1}. Comment.	K3	05	14M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

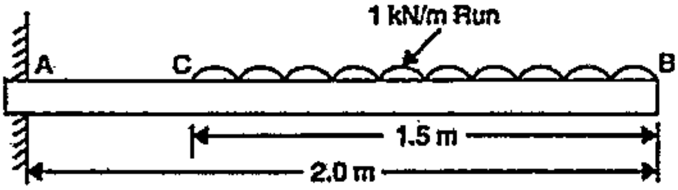
NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20ME2105

II B.Tech. - I Semester Supple Examinations, October-2025
MECHANICS OF SOLIDS
(ME)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

Q.No		Questions	KL	CO	Marks
		Unit-I			
1	a	i) Draw a stress vs. strain diagram for mild steel and mark salient points.	K2	1	7M
		ii) A reinforced concrete column 300 mm x 300 mm in section. The column in reinforced with 8 steel bars of 20 mm diameter. The column carries a load of 360 kN. Find the stresses in the concrete and steel bars? Take E (Steel) = 2.1×10^5 N/mm^2, E (Concrete) = 1.4×10^4 N/mm^2.	K3	1	7M
		OR			
	b	A steel bar of 30 mm square in section is subjected to an axial compressive load of 80 kN. Find the percentage (%) change in volume if the bar is 400 mm long. What are the equal stresses that must be applied to the sides of the bar if the volumetric change is to be zero? Take E = 200 GPa and Poisson's ratio is 0.3.	K4	1	14 M
		Unit-II			
2	a	i) Classify the beams and explain the major differences between a cantilever and a simply supported beam.	K3	2	7M
		ii) Derive the relationship between shear force, bending moment, and rate of loading at a section of a beam.	K2	2	7M
		OR			
	b	The cantilever beam of length 2 m carries a uniformly distributed load (UDL) of 1 kN/m runs over a length of 1.5 m from the fee end. Draw the shear force and bending moment diagrams for the cantilever beam shown below.  	K3	2	14M
		Unit-III			
3	a	i) A 250 mm (depth) × 150 mm (width) rectangular beam is subjected to a maximum bending moment of 750 kNm. Determine: a) The maximum stress in the beam. b) If the value of E for the beam material is 200 GN/m^2, find out the radius of curvature for that portion of the beam where the bending is maximum. c) The value of the longitudinal stress at a distance of 65 mm from the top surface of the beam.	K3	3	7M
		ii) A symmetrical section 200 mm deep has a moment of inertia of 2.26×10^{-5} m^4 about its neutral axis. Determine the longest span over which, when	K3	3	7M

		simply supported, the beam would carry a uniformly distributed load of 4 kN/m run without the stress due to bending exceeding 125 MN/m^2.			
	OR				
	b	i) Derive an expression for the shear stress at any point in a circular section of a beam, which is subjected to a shear force F. And prove that the maximum shear stress in a circular section of a beam is 4/3 times the average shear stress.			7M
		ii) Derive the Bending Moment equation.	K1	3	7M
4	**Unit-IV**				
	a	i) Explain in brief about Macualay's method	K2	4	7M
		ii) A 250 mm long cantilever of rectangular section 40 mm wide and 30 mm deep carries a uniformly distributed load. Calculate the value of w if the maximum deflection in the cantilever is not to exceed 0.5 mm. Take, E = 70 GN/m^2.	K2	4	7M
	OR				
	b	A cantilever beam AB of length 4 m carries a point load of 100 kN at free end and another point load 100 kN at 2 m from the free end. If E =105 N/mm^2 and I =108 mm^4 for the cantilever then determine the slope and deflection at the free end by Double integration method.	K3	4	14M
5	**Unit-V**				
	a	A thick cylinder of 200 mm outside diameter and 140 mm inside diameter is subjected to internal pressure of 40 Mpa and external pressure of 24Mpa. Determine the maximum shear stress in the material of the cylinder at the inside diameter.	K4	5	14M
	OR				
	b	A solid steel shaft has to transmit 75 kW at 200 r.p.m. Taking allowable shear stress as 70 MN/m^2, find a suitable diameter for the shaft, if the maximum torque transmitted on each revolution exceeds the mean by 30%.	K3	5	7M
		A hollow shaft is to transmit 300 kW at 80 r.p.m. If the shear stress is not to exceed 60 MN/m^2 and the internal diameter is 0·6 of the external diameter, find the external and internal diameters assuming that the maximum torque is 1·4 times the mean.	K3	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20EC2102

II B.Tech. - I Semester Supple Examinations, October-2025
ELECTRONIC DEVICES AND CIRCUITS
(ECE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
1		**Unit-I**			
	a	i) Sketch the energy-band diagram for an intrinsic, an n-type, and a p-type semiconductor. Indicate the positions of the Fermi, the donor, and the acceptor levels.	1	1	7M
		ii) Discuss the behavior of the P-N junction diode and the effect of bias on it.	2	1	7M
		OR			
	b	i) Derive diode current equation?	4	1	7M
		ii) a) Define the static and dynamic resistance of a PN diode. b) Are they equal? Justify your answer. c) Do these resistances depend on temperature and bias voltage?	2	1	7M (3+2+2)
2		**Unit-II**			
	a	i) List the different types of rectifiers. With circuit and necessary waveforms explain the operation of the Bridge Rectifier.	2	2	7M (1+6)
		ii) Derive an expression for I_{dc} and I_{rms} for a half-wave rectifier circuit and find its maximum efficiency.	3	2	7M
		OR			
	b	i) Explain the construction and working of the Varactor diode. What are its applications?	2	2	7M
		ii) How is the Zener diode used as a voltage regulator? Give proper diagrams.	3	2	7M
3		**Unit-III**			
	a	i) a) Explain the punch-through mechanism in a transistor. b) Explain the conditions of the cut-off, saturation, and active modes in a transistor.	1	3	7M (4+3)
		ii) Derive the relation between α and β of a transistor.	3	3	7M
		OR			
	b	i) Explain the input and output characteristics of common collector configuration.	2	3	7M
		ii) The collector and base current of an NPN transistor is measured as I_C=5 mA, I_B=50 μA, and I_{CBO}= 1μA. (a) Determine α, β and I_E (b) Determine the new level of I_B required to produce I_C =10 mA.	5	3	7M
4		**Unit-IV**			
	a	i) a) Define the load line with its significance.	3	4	7M

		b) What are the different types of biasing methods? Explain with proper diagrams.			(2+5)
		ii) For a transistor in CE configuration, (a) Derive the expression between I_C, I_B, and I_{CO}.	4	4	7M
	OR				
	b	i) Prove that the bias current I_{CQ} in a voltage divider configuration of the Bipolar Junction Transistor is independent of the change in current gain (β) of the transistor.	5	4	7M
		ii) Draw the transistor biasing circuit using fixed bias arraignment and explain its principle with suitable analysis?	4	4	7M
5	**Unit-V**				
	a	i) Draw a neat sketch to illustrate the structure of an N-channel Enhancement MOSFET. Explain its operation.	3	5	7M
		ii) With the help of a neat diagram, describe the construction and operation of a UJT.	2	5	7M
	OR				
	b	i) a) Define Pinch-off voltage and mark it on the characteristics. Explain its significance in the operation of JFET.	4	5	7M
		ii) Explain about Construction, Operation, and Characteristics of SCR.	2	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20EC2103

II B.Tech. - I Semester Supple Examinations, October-2025
SIGNALS AND SYSTEMS
(ECE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All FIVE Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
		Unit-I			
1	a	(i) Classify the following signals as even or odd, periodic or aperiodic, energy or power signals: $x(t) = e^{-2t}u(t), \quad x(t) = \sin(3t) + \cos(5t)$	3	1	7M
		ii) Perform the following operations on the given signal: Time Shifting, Time Scaling, & Time Reversal. Signal is, $x(t) = e^{-t}u(t)$:	2	1	7M
		OR			
	b	(i) Explain the concept of correlation and derive the expression for auto-correlation of a signal. $x(t) = \begin{cases} A, & 0 \leq t \leq T/2 \\ -A, & T/2 \leq t \leq T \end{cases}$	3	1	7M
		(ii) Explain aliasing in the context of sampling and discuss methods to avoid aliasing.	2	1	7M
		Unit-II			
2	a	i) Determine the Trigonometric Fourier Series coefficients for the signal:	3	2	7M
		ii) Discuss the Dirichlet conditions and their significance in Fourier Series expansion.	2	2	7M
		OR			
	b	(i) Explain how orthogonality of functions helps in approximating signals and provide an example. (ii) Prove that the Exponential Fourier Series coefficients can be obtained from the Trigonometric Fourier Series coefficients.	3, 2	2, 2	14M
		Unit-III			
3	a	i) Compute the Fourier Transform of the signal: $x(t) = e^{-\lvert t \rvert}$	3	3	7M
		(ii) Explain the significance of Hilbert Transform in signal analysis.	2	3	7M
		OR			
	b	(i) State and prove the Convolution theorem for Fourier Transform.	3	3	7M
		(ii) Find the Fourier Transform of a rectangular pulse: $x(t) = \begin{cases} 1, & -T \leq t \leq T \\ 0, & \text{otherwise} \end{cases}$	2	3	7M
		Unit-IV			
4	a	(i) Determine the Laplace Transform of the function:	3	4	7M

		$x(t) = e^{-at}u(t) + e^{-bt}u(t)$			
		(ii) Explain the concept of Region of Convergence (ROC) in Laplace Transform and its significance.	2	4	7M
		OR			
	b	(i) Find the Z-Transform of the signal: $x(n) = a^n u(n) + b^n u(-n)$	3	4	7M
		(ii) Derive the relation between Z-Transform and Discrete-Time Fourier Transform (DTFT).	2	4	7M
5		**Unit-V**			
	a	(i) Find the impulse response of an LTI system if the input and output are related by the equation: $y(t) = \int_{-\infty}^{t} x(\tau)e^{-(t-\tau)}d\tau$	3	5	7M
		(ii) Explain the concept of distortion less transmission through an LTI system and derive the conditions for it.	2	5	7M
		OR			
	b	(i) Explain the characteristics of Ideal Low-Pass Filter (LPF), High-Pass Filter (HPF), and Band-Pass Filter (BPF).	2	5	7M
		(ii) Find whether the given system is Linear or Nonlinear, Time-Invariant or Time-Variant: $y(t) = x^2(t) + 3x(t-1)$	3	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M: Marks

NEC NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subjectcode: R20EC2104

II B.Tech. - I Semester Supple Examinations, October-2025
SWITCHING THEORY AND LOGIC DESIGN
(ECE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
		Unit-I			
1	a	Subtract the following numbers using 2's and 1's complement (i) 5250 – 321 (ii) 753 – 864 (iii) 3570 – 2100 (iv) 20 – 1000	3	1	7M
		Explain about weighted and non-weighted codes	2	1	7M
		OR			
	b	Explain the following codes a) Gray code b) Weighted Codes c) Hamming code	3	1	8M
		Perform the following addition using excess-3 code. i)386+756 ii)1010 + 444	3	1	6M
		Unit-II			
2	a	Express the following functions in sum of minterms and product of maxterms i) f(A,B.C.D) = B`D + A`D + BD ii) f (x,y,z) = (xy+z)(xz+y)	3	2	7M
		Minimize the given 5 variable function using K-map method f = Σ (3, 4, 9, 10, 11, 12, 18, 20, 21, 22, 23, 25, 26, 30)	3	2	7M
		OR			
	b	Simplify the following using QM Tabular Method F(A , B , C , D , E) = Σ(0, 2, 4, 6, 9, 11, 13, 15, 17, 21, 25, 27, 2, 31)	3	2	14M
		Unit-III			
3	a	Define decoder. Construct 3x8 decoder using logic gates and truth table	3	3	7M
		Define an encoder. Design octal to binary encoder	2	3	7M
		OR			
	b	Implement the following Boolean function with a multiplexer (i) F(A, B, C, D) = ∑(1, 2, 5, 8, 6, 10,12,14) (ii) F(A, B, C, D) = ∑(1, 2, 5,6, 12)	3	3	7M
		Draw the circuit diagram of a 4-bit adder-subtractor and briefly describe its functionality?	3	3	7M
		Unit-IV			
4	a	Draw the logic diagram of a JK flip- flop and using excitation table explain its operation.	2	4	7M
		What do you mean by triggering? Explain the various triggering modes with examples	2	4	7M
		OR			
	b	What are the capabilities and limitations of Final State Machines?	2	4	7M
		Draw the circuit diagram of universal shift register and explain its operation	2	4	7M
		Unit-V			
5	a	Implement the following Boolean functions with a PLA i) F (x,y,z) = ∑ (0,1,2,5,6) ii) F (x,y,z) = ∑(1,3,6,7)	3	5	8M
		Write the difference between PROM, PLA.	2	5	6M

	OR				
	b	Obtain the programmable table for three digit binary to excess-3 code conversion using PLA.	3	5	7M
		Implement Full adder circuit using ROM	3	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20EC2105

II B.Tech. - I Semester Supple Examinations, October-2025

LINEAR CONTROL SYSTEMS

(ECE)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
		Unit-I			
1	a	Distinguish between open loop and closed loop control systems?	III	1	7M
		A closed loop system is represented by the following differential equation $\frac{d^3c}{dt^3}+2\frac{d^2c}{dt^2}+4\frac{dc}{dt}=20e$. Where e = r=0.8c. Identify the quantities c, r and e and draw a block diagram to represent the system. Find the overall transfer function of the system?	IV	1	7M
		OR			
	b	Write down Mason's gain formula and explain each of them there in?	III	1	7M
		Draw a signal flow graph for the following set of linear equations $y_1+y_2+5y_3=0$ $3y_1+2y_2-4y_3=2$ $-y_2-y_3=0.$ Also obtain the overall transfer function?	III	1	7M
		Unit-II			
2	a	Derive the unit step response to a typical second order system?	V	2	7M
		As a closed loop servo is represented by the differential equation $\frac{d^2c}{dt^2}+8\frac{dc}{dt}=64e$. Where "c" is the displacement of the output shaft, r is the displacement of the input shaft and e = r-c. Determine i) the undamaped natural frequency ii) Damping ratio iii) the percentage maximum overshoot for unit step input.	V	2	7M
		OR			
	b	Establish the relationship between the ratio and the percentage overshoot for a step response of a system?	VI	2	7M
		The open loop transfer function of a unity feedback system is given by $G(s)=\frac{k}{s(Ts+1)}$. Where k and T are positive constants. By what factor should the amplifier gain be reduced so that the peak overshoot of unit step response of the system is reduced from 75% to 25%?	IV	2	7M
		Unit-III			
3	a	State and explain the rules for sketching the root loci for a feedback system?	III	3	14M
		OR			
	b	Sketch the root loci for the feedback system whose open loop transfer function $G(s)H(s)=\frac{k}{s(s+4)(s^2+4s+20)}$	III	3	7M
		Unit-IV			
4	a	Test the stability of the control system whose	III	4	14M

		G(s))H(s) = $\frac{2(s+1)}{s(s+3)(s+4)}$.			
	OR				
	b	Sketch the Nyquist plot for G(s)H(s) = $\frac{200}{s(s+5)(s+10)}$ and determine whether (or) not the closed loop system is stable?	I	4	14M
5	**Unit-V**				
	a	For G(s) = $\frac{k}{s(s+2)(s+20)}$. Design a lag compensator, given PM 35$\square^0$and K$\square_v$ 20.	I	5	14M
	OR				
	b	A system is characterised by the following state space equations $\begin{bmatrix}\dot{x_1}\\ \dot{x_2}\end{bmatrix}=\begin{bmatrix}-3 & 1\\ -2 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}+\begin{bmatrix}0\\ 1\end{bmatrix}$u: t>0 y = $\begin{bmatrix}1 & 0\end{bmatrix}\begin{bmatrix}x_1\\ x_2\end{bmatrix}$ Find i) the TF of the system ii) Compute the state transition matrix iii) Solve the state equation for a unit step input under zero initial condition.	III	5	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CI2101

II B.Tech. - I Semester Supple Examinations, October-2025
COMPUTER ORGANIZATION

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	KL	CO	Marks
1		**Unit-I**			
	a	Explain in detail about Functional units of Basic Computer.	2	1	7M
		Elaborate shift micro operations functioning with an example.	2	1	7M
		OR			
	b	With neat sketch explain the process of transferring the data between various components of computer using bus structures.	3	1	7M
		Classify the micro operations of digital computer and explain arithmetic micro operations like binary adder, sub tractor and incrementer.	3	1	7M
2		**Unit-II**			
	a	Explain the instruction cycle with help of a flow chart.	2	2	7M
		Elaborate various types memory reference instructions with suitable examples	3	2	7M
		OR			
	b	Illustrate various types of register reference instructions with suitable Examples.	3	2	14M
3		**Unit-III**			
	a	Explain about the different types of addressing modes.	2	3	7M
		Evaluate the arithmetic statement X = (A+B) * (C+D) using a general register computer with three address, and two address instruction format	3	3	7M
		OR			
	b	With a neat diagram, explain the instruction pipeline processing in RISC architecture	3	3	7M
		Explain how microinstructions execution takes place.	2	3	7M
4		**Unit-IV**			
	a	Discuss about Booth's multiplication algorithm.	2	5	7M
		Illustrate different types of mapping functions in cache memory.	3	4	7M
		OR			
	b	Explain in detail about Auxiliary memory.	2	4	7M
		Multiply each of the following pairs of signed 2's complement numbers using booth algorithm and bit pairing of the multiplier (Assume A is the Multiplicand and B is the Multiplier. A=010111 B=110110 A=110011 B=101100	3	5	7M
5		**Unit-V**			
	a	Explain the data transfer procedure for source initiated using handshaking.	2	6	7M
		With a neat sketch explain the working principle of DMA	3	6	7M
		OR			
	b	Discuss handshake process in Asynchronous data transfer .	2	6	7M
		How daisy chaining priority and parallel priority interrupt work? Analyse.	3	6	7M

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks

NEC
NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20AI2101

II B.Tech. - I Semester Supple Examinations, October-2025
DATA SCIENCE
(AI)

Time: 3 hours **Max. Marks: 70**

Note: Answer All **FIVE** Questions.
All Questions Carry Equal Marks (5 X 14 =70M)

QNo		Questions	K L	CO	Marks
1		**Unit-I**			
	a	i)What is Data Science? Discuss the steps involved in the Data Science process.	2	1	7M
		ii) How can you express conditional logic using NumPy arrays? Give example.	2	1	7M
		OR			
	b	i) Explain the different data types available for ndarrays in NumPy.	2	1	7M
		ii) What is fancy indexing in NumPy? Provide an example of using fancy indexing to select specific rows and columns in a 2D array.	2	1	7M
2		**Unit-II**			
	a	(i) illustrate the Fundamental Libraries available for data science applications.	2	2	7M
		ii) What are the main data structures in pandas? Explain their differences.	2	2	7M
		OR			
	b	i) Explain the architecture of the pandas library.	2	2	7M
		ii) What functions in pandas can be used to compute descriptive statistics of a dataset? Explain with example.	2	2	7M
3		**Unit-III**			
	a	i) What is JSON? Explain about reading a JSON file into a pandas DataFrame.	2	3	7M
		ii) Discuss the methods used to Read and Write Data in Text Format.	2	3	7M
		OR			
	b	i) What is Web API? Explain Interacting with HTML and Web APIs.	2	3	7M
		ii)Discuss about reading HDF5 and Excel files in python using pandas.	2	3	7M
4		**Unit-IV**			
	a	i) What is hierarchical indexing, and how does it help in reshaping data?	2	4	7M
		ii) How can we combine and merge datasets in python programming? Give example.	2	4	7M
		OR			
	b	i) What are figures and subplots in matplotlib? Explain how multiple plots can be created within a single figure.	2	4	7M
		ii) Compare and contrast line plots, bar plots, and histograms. When should each be used?	2	4	7M
5		**Unit-V**			
	a	i) Describe how to select a column or a subset of columns from a GroupBy object and perform operations on them. Give an example.	2	5	7M
		ii) What is the split-apply-combine strategy in GroupBy operations? Give	2	5	7M

		example for Filling Missing Values with group-specific values.			
	OR				
	b	i) Discuss how to apply multiple aggregation functions column-wise on a grouped DataFrame.	**2**	**5**	**7M**
		ii) How can you iterate over groups in a GroupBy object? Illustrate with an example.	**2**	**5**	**7M**

KL: Blooms Taxonomy Knowledge Level CO: Course Outcome M:Marks