**I B.Tech I Semester Regular & Supple. Examinations, December-2024**   **R23**

Sub Code: R23CC1101        **LINEAR ALGEBRA & CALCULUS**

Time: 3 hours                    (Common to All Branches)                Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

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## PART-A
### Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 1 | a | If A, B and C are the angles of a non-right angled triangle ABC, then find the value of $\begin{vmatrix} \tan A & 1 & 1 \\ 1 & \tan B & 1 \\ 1 & 1 & \tan C \end{vmatrix}$. | K3 | CO1 | 2M |
| | b | If $\begin{bmatrix} x^2-4x & x^2 \\ x^2 & x^3 \end{bmatrix} = \begin{bmatrix} -3 & 1 \\ -x+2 & 1 \end{bmatrix}$, then the value of x? | K2 | CO1 | 2M |
| | c | Given  an eigen value of a matrix A, write the eigen values of following matrices: $A^T$ and $A^n$. | K1 | CO2 | 2M |
| | d | Given that $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$, find the eigen values of A. | K3 | CO2 | 2M |
| | e | State Lagrange's mean value theorem. | K1 | CO3 | 2M |
| | f | Give an example of a function for which Rolle's theorem is not applicable. | K3 | CO3 | 2M |
| | g | Find the Jacobian for the functions $x = r \cos \theta$ ; $y = r \sin \theta$. | K2 | CO4 | 2M |
| | h | State Euler's theorem for function of three variables. | K1 | CO4 | 2M |
| | i | Evaluate $\int_0^3 \int_0^1 (x^2 + 3y^2) \, dy \, dx$. | K4 | CO5 | 2M |
| | j | Change the order of integration $\int_0^1 \int_x^{\sqrt{x}} f(x,y) \, dy \, dx$. | K3 | CO5 | 2M |

## PART-B
### Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 2 | | Unit-I | | | |
| | a | i) For what values of x, will the matrix $A = \begin{bmatrix} 3-x & 2 & 2 \\ 1 & 4-x & 0 \\ -2 & -4 & 1-x \end{bmatrix}$ be of rank less than 3. | K4 | CO1 | 5M |
| | | ii) Solve the following system of equations $x + 2y + 3z = 0$; $2x + 3y + z = 0$; $4x + 5y + 4z = 0$; $x + 2y - 2z = 0$. | K3 | CO1 | 5M |
| | | OR | | | |

| | | | KL | CO | M |
|---|---|---|---|---|---|
| | b | i) By reducing the following matrix A into Normal form find the rank of A $$A = \begin{bmatrix} -1 & 2 & -1 & -2 \\ -2 & 5 & 3 & 0 \\ 1 & 0 & 1 & 10 \end{bmatrix}.$$ | K4 | CO1 | 5M |
| | | ii) Discuss the consistency of the system and if consistent, solve the equations: $x + y + z = 6$; $x + 2y + 3z = 14$; $2x + 4y + 7z = 30$. | K3 | CO1 | 5M |
| 3 | | Unit-II | | | |
| | a | Verify Cayley-Hamilton theorem and find $A^8$, Where $$A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}.$$ | K3 | CO2 | 10M |
| | | OR | | | |
| | b | Reduce the quadratic form $2x_1^2 + x_2^2 + x_3^2 + 2x_1x_2 - 2x_1x_3 - 4x_2x_3$ to canonical form by an orthogonal transformation. Also find the rank, index, signature and nature of the quadratic form. | K3 | CO2 | 10M |
| 4 | | Unit-III | | | |
| | a | i) Verify Rolle's theorem for the function $f(x) = (x - a)^m (x - b)^n$ in [a, b], where m, n are positive integers. | K3 | CO3 | 5M |
| | | ii) Expand $f(x) = x^5 - x^4 + x^3 - x^2 + x - 1$ in powers of (x - 1). | K3 | CO3 | 5M |
| | | OR | | | |
| | b | i) If $f(x) = \sqrt{x}$ and $g(x) = \dfrac{1}{\sqrt{x}}$, prove that c of Cauchy's mean value theorem is geometric mean between a and b, $a > 0, b > 0$. | K3 | CO3 | 5M |
| | | ii) Expand $5^x$ up to the first three non-zero terms of the series using Maclaurin's theorem. | K3 | CO3 | 5M |
| 5 | | Unit-IV | | | |
| | a | i) If $u = \dfrac{e^{x+y+z}}{e^x + e^y + e^z}$, show that $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 2u$. | K3 | CO4 | 5M |
| | | ii) Find the extreme values of $x^3 + y^3 - 3axy$, $a > 0$. | K3 | CO4 | 5M |
| | | OR | | | |
| | b | i) If $y \log(\cos x) = x \log(\sin y)$, find $\dfrac{dy}{dx}$. | K3 | CO4 | 5M |
| | | ii) Show that the rectangular solid of maximum volume that can be inscribed in a sphere is a cube. | K3 | CO4 | 5M |
| 6 | | Unit-V | | | |
| | a | Evaluate $\iint x^2 \, dx \, dy$, over the region in the first quadrant enclosed by the rectangular hyperbola $xy = 16$, the lines $y = x$, $y = 0$ and $x = 8$. | K3 | CO5 | 10M |
| | | OR | | | |
| | b | Evaluate $\displaystyle\int_1^e \int_1^{\log y} \int_1^{e^x} \log z \, dx \, dy \, dz$. | K3 | CO5 | 10M |

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

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**I B.Tech I Semester Regular & Supple. Examinations, December-2024**  **R23**

Sub Code: R23CC1102     **INTRODUCTION TO PROGRAMMING**

Time: 3 hours          (Common to All Branches)       Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

## PART-A
### Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 1 | a | Describe type conversion with examples of implicit and explicit conversion | K3 | 1 | 2M |
| | b | Examine how the flowchart **tool Dia** can be used to represent an algorithm. | K4 | 1 | 2M |
| | c | Demonstrate the use of a for loop to print the first 10 natural numbers | K3 | 2 | 2M |
| | d | List the conditional statements with syntax. | K3 | 2 | 2M |
| | e | Differentiate **1D array** verses **2D array** with an example? | K3 | 3 | 2M |
| | f | How do you read and write strings in C? Provide a simple syntax. | K4 | 3 | 2M |
| | g | Demonstrate the difference between **ptr++** and **++ptr** using a pointer to an integer. | K3 | 4 | 2M |
| | h | Compare and contrast between structure and union? | K3 | 4 | 2M |
| | i | Write C program to demonstrate the difference between function declaration and definition | K4 | 5 | 2M |
| | j | Describe any 3 built-in functions to perform basic file operations in C? | K3 | 5 | 2M |

## PART-B
### Answer either 'a' or 'b' from each question of **PART-B** (5 x 10M = 50M)

| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 2 | | Unit-I | | | |
| | a | i) Analyze the process of compilation and execution in programming languages. | K4 | 1 | 5M |
| | | ii) Explain the role of the ALU and program counter in the basic organization of a computer. | K3 | 1 | 5M |
| | | OR | | | |
| | b | i) How does the top-down approach help in problem-solving, and how is it different from the bottom-up approach? | K3 | 1 | 5M |
| | | ii) Discuss the impact of time and space complexities on algorithm performance. | K3 | 1 | 5M |
| 3 | | Unit-II | | | |
| | a | i) Write C program that takes an integer input from the user and prints whether the number is even or odd. | K4 | 2 | 5M |
| | | ii) Briefly explain Switch statement with example. | K3 | 2 | 5M |
| | | OR | | | |
| | b | i) Write C program that prints the first 10 Fibonacci numbers using a while loop. | K4 | 2 | 5M |
| | | ii) Demonstrate **Break** and **Continue** statements with example. | K3 | 2 | 5M |

| | | | KL | CO | M |
|---|---|---|---|---|---|
| | | **Unit-III** | | | |
| 4 | a | i) Write a program to search for a given number in an array of integers. | K4 | 3 | 5M |
| | | ii) Explain string manipulation functions with examples. Use **strcpy, strcat and strlen.** | K3 | 3 | 5M |
| | | OR | | | |
| | b | i) Describe the memory model of arrays in C. How are array elements stored sequentially? | K3 | 3 | 5M |
| | | ii) Write C program to read an array of strings and display the longest string among them. | K4 | 3 | 5M |
| 5 | a. | **Unit-IV** | | | |
| | | i) Write C program to define a structure Student with fields name, age, and marks. Input and display data for a student. | K4 | 4 | 5M |
| | | ii) Demonstrate the memory usage of a structure and a union. Compare their sizes. | K3 | 4 | 5M' |
| | | OR | | | |
| | b | i) Create a program that swaps the values of two variables using pointers | K3 | 4 | 5M |
| | | ii) Briefly explain the concept of pointers in C. Provide an example illustrating their use. | K3 | 4 | 5M |
| 6 | a | **Unit-V** | | | |
| | | i) Discuss about the type of functions in C. Provide an example to illustrate it. | K3 | 5 | 5M |
| | | ii) Examine the difference between pass by value and pass by reference in C functions | K4 | 5 | 5M |
| | | OR | | | |
| | b | i) Write C program to count the number of characters, words, and lines in a text file. | K3 | 5 | 5M |
| | | ii) Develop a function that appends new data to an existing file without overwriting its content | K3 | 5 | 5M |

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

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**I B.Tech I Semester Regular & Supple. Examinations, December-2024**

Sub Code: R23CC1106  ENGINEERING PHYSICS
Time: 3 hours  (CE, EEE, ME, ECE, CSE (AIML), DS, CS, AIML)  Max. Marks: 70

Note: Question Paper consists of Two parts (Part-A and Part-B)

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## PART-A
### Answering all the questions from Part-A is compulsory (10 x 2M = 20M)

| Q. No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 1 | a | Mention the differences between spontaneous and stimulated emissions. | K1 | 1 | 2M |
| | b | Define acceptance cone. | K1 | 1 | 2M |
| | c | Define space lattice and unit cell. | K1 | 2 | 2M |
| | d | Draw the planes of a cubic cell (i) ($\bar{1}11$) (ii) (101). | K4 | 2 | 2M |
| | e | Define magnetic susceptibility and permeability. | K1 | 3 | 2M |
| | f | Write the properties of super conductors | K1 | 3 | 2M |
| | g | State Heisenberg's uncertainty principle. | K1 | 4 | 2M |
| | h | Write any two merits of classical free electron theory. | K1 | 4 | 2M |
| | i | State Hall effect. | K1 | 5 | 2M |
| | j | What are thermoelectric materials? | K1 | 5 | 2M |

## PART-B
### Answer either 'a' or 'b' from each question of PART-B (5 x 10M = 50M)

| Q. No | | Questions | KL | CO | Marks |
|---|---|---|---|---|---|
| | | **Unit-I** | | | |
| 2 | a | i) With the help of suitable diagrams, explain the principle, construction and working of a Ruby laser. | K4 | 1 | 7M |
| | | ii) Mention the applications of lasers in the different fields. | K1 | 1 | 3M |
| | | **OR** | | | |
| | b | i) Explain the construction and working of a step-index fiber. | K2 | 1 | 5M |
| | | ii) Discuss the propagation of light signal in step-index fiber. | K3 | 1 | 5M |
| | | **Unit-II** | | | |
| 3 | a | i) Prove that FCC is more closed packed structure than the SC and BCC. | K3 | 2 | 10M |
| | | **OR** | | | |
| | b | i) Derive an expression for the interplanar spacing between two adjacent planes of Miller indices (h k l) in a cubic lattice of edge a. | K3 | 2 | 7M |
| | | ii) Calculate the interplanar spacing for (111) plane in an SC lattice, where lattice constant is $2.4 \times 10^{-10}$ m. | K4 | 2 | 3M |
| | | **Unit-III** | | | |
| 4 | a | i) Explain atomic origin of magnetism in magnetic materials. | K2 | 3 | 6M |
| | | ii) Mention the differences between soft and hard magnetic materials. | K4 | 3 | 4M |
| | | **OR** | | | |
| | b | i) What are the differences between type-1 and type -2 super conductors? | K2 | 3 | 4M |
| | | ii) Explain AC and DC Josephson effects. | K1 | 3 | 6M |
| 5 | | **Unit-IV** | | | |
| | a | i) Determine the energy of a particle enclosed in one-dimensional potential box of infinite height. | K5 | 4 | 7M |
| | | ii) Find the energy of an electron for the first excited state in one dimensional potential box of width 4 A⁰. | K4 | 4 | 3M |
| | | **OR** | | | |
| | b | i) Explain briefly the quantum free electron theory. | K2 | 4 | 3M |
| | | ii) Explain Fermi-Dirac distribution function. Plot this function for various temperatures including 0K. | K2 | 4 | 7M |
| 6 | | **Unit-V** | | | |
| | a | i) Distinguish conductors, semiconductors and insulators. | K3 | 5 | 6M |
| | | ii) What are extrinsic semiconductors and explain? | K1 | 5 | 4M |
| | | **OR** | | | |
| | b | i) What are the types of smart materials? | K1 | 5 | 4M |
| | | ii) Explain the principle and properties of magneto rheological fluids-electro rheological fluids. | K2 | 5 | 6M |

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

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**I B.Tech I Semester Regular & Supple. Examinations, December-2024**

**R23**

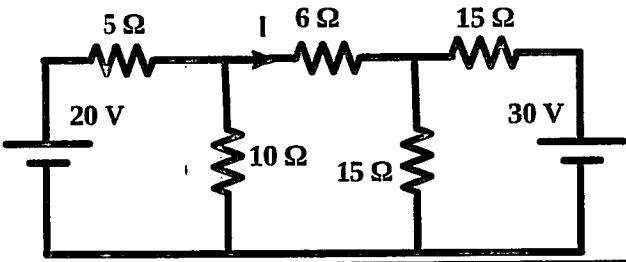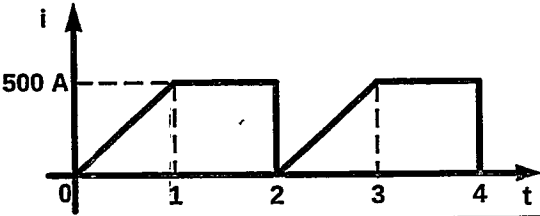Sub Code: R23CC1107    **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**
Time: 3 hours                (CE,EEE,ME,ECE,CSE(AIML),DS,CS,AIML)   Max. Marks: 70

PART-A:(EEE)

| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 1 | a | What are the limitations of Ohms law? | K1 | 1 | 1M |
| | b | What is the significance of commutator of a DC generator? | K3 | 2 | 1M |
| | c | What are the drawbacks of non-conventional energy sources? | K3 | 3 | 1M |
| | d | Define phase, peak factor and form factor of an AC wave form | K1 | 1 | 1M |
| | e | What is meant by controlling and damping torques of an instrument? | K3 | 4 | 1M |
| | | **Unit-I** | | | |
| 2 | a | i)Classify the electric circuit elements and explain each of them | K1 | 1 | 5M |
| | | ii)Find the current (I) flowing through 6 Ohms resistor of the circuit shown below using superposition theorem  | K2 | 1 | 5M |
| | | **OR** | | | |
| | b | i) Draw the impedance and power triangles for series RL circuit. | K2 | 1 | 5M |
| | | ii) a)   Determine the form factor and amplitude factor of the waveform shown below  | K2 | 1 | 5M |
| | | **Unit-II** | | | |
| 3 | a | i)With a neat diagram explain the construction and working principle of DC motor, clearly discuss each part of the motor | K3 | 2 | 10M |
| | | **OR** | | | |
| | b | i)Explain the principle of operation of Three-phase Induction motor | K3 | 2 | 5M |
| | | ii)Explain the construction and working principle of Moving Iron instruments | K3 | 2 | 5M |
| | | **Unit-III** | | | |
| 4 | a | i)What are the advantages and disadvantages of renewable and non-renewable energy sources | K2 | 3 | 5M |
| | | ii) With a neat sketch, explain the hydel power generation | K3 | 3 | 5M |
| | | **OR** | | | |
| | b | i)   With a neat sketch explain the wind power generation | K3 | 3 | 5M |
| | | ii)Write down any six safety precautions used in electrical system | K3 | 4 | 5M |

| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| 5 | a | What is Zener Effect? | K1 | 1 | 1M |
| | b | What is the significance of amplifier? | K2 | 2 | 1M |
| | c | Give the truth table of XNOR gate | K1 | 3 | 1M |
| | d | What is the significance of FLIP-FLOP? | K1 | 3 | 1M |
| | e | What is the use of counter in digital electronics? | K2 | 4 | 1M |
| | | **Unit-IV** | | | |
| 6 | a | i)Explain the characteristics of Zener diode | K2 | 1 | 5M |
| | | ii)Explain the characteristics of NPN transistor | K2 | 1 | 5M |
| | | **OR** | | | |
| | b | i) With a neat circuit diagram explain the working of common emitter amplifier along with its frequency response | K1 | 1 | 10M |
| | | **Unit-V** | | | |
| 7 | a | i) Explain the operation of a half wave bridge rectifier with a neat circuit and also draw the relevant waveforms. | K2 | 2 | 10M |
| | | **OR** | | | |
| | b | i) Explain the block diagram of an electronic instrumentation system and clearly explain each block of it. | K1 | 3 | 10M |
| | | **Unit-VI** | | | |
| 8 | a | i) Explain AND, NOR, XOR and NOT gates along with their truth tables | K1 | 3 | 5M |
| | | ii) Design & implement half adder with truth table. | K3 | 3 | 5M |
| | | **OR** | | | |
| | b | i)Explain J-K flip-flop with relevant truth tables | K2 | 4 | 5M |
| | | ii)Explain about serial input and output registers what is meant by ring counter? | K2 | 4 | 5M |

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

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**I B.Tech I Semester Regular & Supple. Examinations, December-2024**

**R23**

Sub Code: R23CC1108      **ENGINEERING GRAPHICS**

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

Note: Answer All **FIVE** Questions.

All Questions Carry Equal Marks    (5 X 14 = 70M)
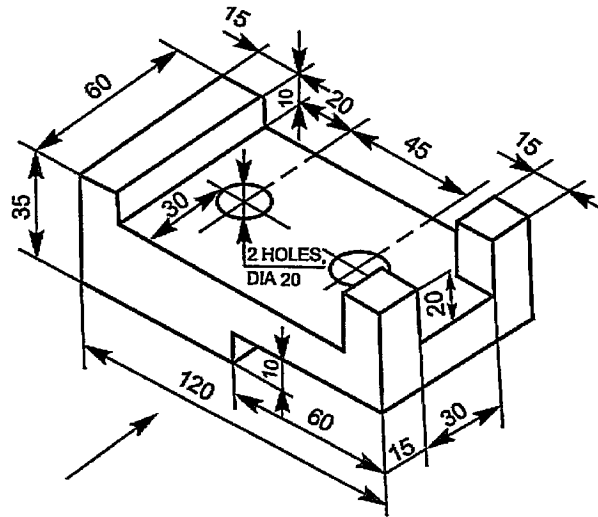
| Q.No | | Questions | KL | CO | M |
|---|---|---|---|---|---|
| | | **Unit-I** | | | |
| 1 | a | Draw the curve traced by a point on the circumference of a circle of 40 mm diameter, which rolls on straight line for one complete revolution. | K3 | CO1 | 14M |
| | | **OR** | | | |
| | b | Draw a diagonal scale of RF=3/100, showing meters, decimeters and centimeters and to measure up to 5 meters. Show the length of 3.69 meters on it. | K2 | CO1 | 14M |
| | | **Unit-II** | | | |
| 2 | a | A line AB, 80 mm long, is inclined at $45^0$ to the H.P. and its top view makes an angle of $60^0$ with the V.P. The end A is in the H.P. and 15 mm in front of V.P. Draw its front view and finds its true inclination with the V.P. | K3 | CO2 | 14M |
| | | **OR** | | | |
| | b | A rectangle of 30 mm and 60 mm sides is resting on HP on one of its small side which is $30^0$ inclined to VP, while the surface of the plane makes $45^0$ inclination with HP. Draw it's projections. | K3 | CO2 | 14M |
| | | **Unit-III** | | | |
| 3 | a | A pentagonal pyramid, having base with a 25 mm side and 60 mm long axis, rests on an edge of the base on the H.P. with an axis perpendicular to the V.P. Draw its projections when the base is 15 mm in front of the V.P. | K4 | CO3 | 14M |
| | | **OR** | | | |
| | b | A cone 60 mm diameter and 50 mm axis is resting on one generator on HP Draw its projections. | K3 | CO3 | 14M |
| 4 | | **Unit-IV** | | | |
| | a | A pentagonal pyramid of 30 mm side of base and height of 45 mm stands on its base with an edge of the base parallel to VP. A section plane making an angle of $45^0$ to HP cuts the pyramid at a distance of 15mm from apex. Draw its top view and front view. | K4 | CO4 | 14M |
| | | **OR** | | | |
| | b | A hexagonal prism of base side 30 mm and height 45 mm is resting on one of its ends on the HP with two of its lateral faces parallel to the VP. It is cut | K4 | CO4 | 14M |

| | | | | | |
|---|---|---|---|---|---|
| | | by a plane perpendicular to the VP and inclined at $30^0$ to the HP. The plane meets the axis at a distance of 20 mm above the base. Draw the development of the lateral surfaces of the lower portion of the prism. | | | |

## Unit-V

| 5 | a | Draw the (i) Front view (**Marked as 'arrow'**) (ii) Top view and (iii) Side view for the below figure.<br><br><br><br>(Note: All dimensions are in **mm**) | K4 | CO5 | 14M |
|---|---|---|---|---|---|

**OR**

| | b | Draw isometric view for the given orthographic projections.<br><br><br><br>(Note: All dimensions are in **mm**) | K4 | CO5 | 14M |
|---|---|---|---|---|---|
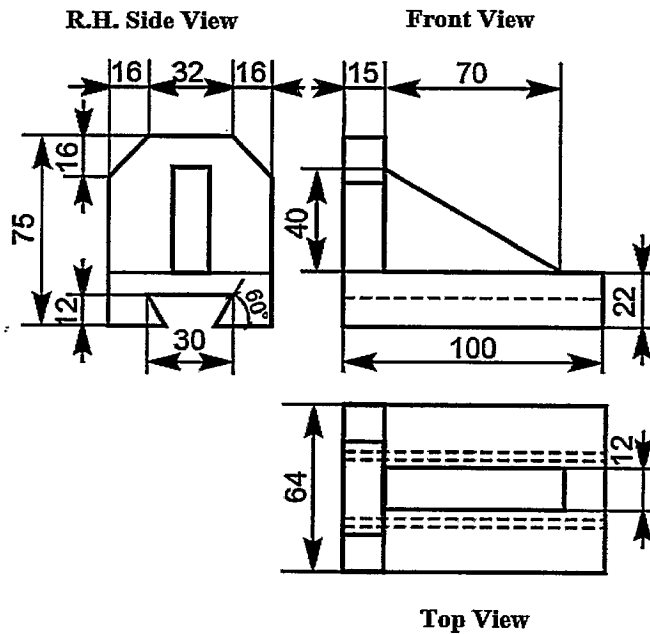
KL: Blooms Taxonomy Knowledge Level  CO: Course Outcome     M:Marks

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