Narasaraopeta Engineering College (Autonomous)
Kotappakonda Road, Yellamanda (P.O), Narasaraopet- 522601, Guntur District, AP.

Subject Code: **R20CC1101**

I B. Tech - I Semester Supple Examinations, December-2023

Technical and Communicative English-I

Time: 3 Hours Branch: Common to all Branches. Max.Marks:**70**.

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

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1. A) I) Justify the title "A Drawer Full of Happiness". 8 M

II) Rewrite the following sentences using appropriate Punctuation marks: 6 M

(i) thanks for all your help john

(ii) ive seen that movie several times

(iii) a wise man once said within the body of every person lies a skeleton

(iv) wow you have won the match

(v) it isn't ready yet

(vi) Lalitha said is it your dress

OR

B) I) Bring out the feelings of Aanchal Jagnani on seeing the drawer after 25 years.

II) Write a paragraph on the impact of Corona Virus on human life

2. A) I) Explain the important elements of Nehru's letter to his daughter. 8 M + 6M

II) Fill in the blanks with Prepositions:

(i) Don't depend ____ others.

(ii) I have been working in this office ____ 2002.

(iii) I received the message _____ 7o' clock.

(iv) We will meet ____ 7th December.

(v) Shreya's birthday is _____ March.

(vi) I did not go to the football match, but I watched it___ television.

OR

B) I) "Nehru's letter to Indira is the best present a father can give to his daughter." Argue in favour of the statement. 8 M

II) Write Synonyms of the following words: 6 M

(i) prototype (ii) authorize (iii) crazy (iv) deliberate (v) efficient (vi) initiate

3. A) I) Elaborate how Stephen Hawking's life an epitome of positivity. 8 M + 6 M

II) Fill in the blanks with appropriate Tense forms of the verbs given in the brackets:

(i) If I had studied here, I _____ (score) better marks in the examination.

(ii) He ____ (play) badminton every morning.

(iii) She usually _____ (put) on black shoes.

(iv) Last week Lalitha and Sarat ____ (go) to a movie.

(v) I _____ (finish) it by the end of this month.

(vi) Sindhu _____ (play) tennis for several years now.

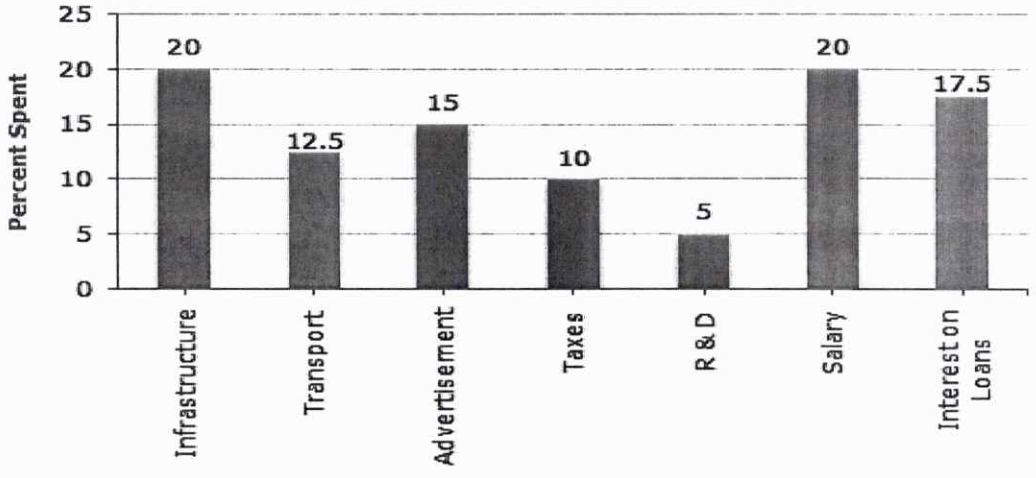
OR

B) I) You live in a room in college hostel which you share with another student. There are many problems with this arrangement and you find it difficult to study. Write a letter to the Hostel Warden requesting to change your room. 7 M + 7 M

II) Imagine that you are in a restaurant. You have ordered soup, but when it arrives, it is cold. Develop a conversation with the waiter complaining about it.

4. A) I) Elaborate Wangari Maathai's contribution to conservation of nature. 7 M

II) The bar graph given below shows the percentage distribution of the total expenditure of a company under various expense heads during 2022. Write a paragraph explaining the bar graph. 7 M



OR

B) I) Explain how "Like a Tree, Unbowed" reflect Wangari Maathai's concern for environmental issues. 7 M

II) Assume that you are applying for MS in a foreign university and prepare Statement of Purpose. 7 M

5. A) I) Summarise the lessons you have learnt from the life of Steve Jobs.8M

II) Rewrite the following sentences making necessary corrections: 6 M

(i) Nile is in Egypt.

(ii) I have waited for him since an hour.

(iii) Either of us are willing to answer.

(iv) Harish and me went to a movie.

(v) The sceneries of the Himalayas are attractive.

(vi) John speaks to me yesterday.

OR

B) I) "Failures are stepping stones of success." Examine the statement with reference to "Stay Hungry- Stay Foolish." 8 M

II) Elaborate the techniques of Intensive and Extensive Reading. 6 M

Narasaraopeta Engineering College (Autonomous)
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Subject Code: **R20CC1102**

I B. Tech - I Semester Supple Examinations, December-2023

Linear Algebra & Calculus

Time: 3 Hours | Branch: Common to all Branches. | Max.Marks:**70.**

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

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1. I) Find non-singular matrices P and Q such that PAQ is in a normal form where $A=\begin{bmatrix}2 & 1 & -3 & -6\\ 3 & -3 & 1 & 2\\ 1 & 1 & 1 & 2\end{bmatrix}$ and hence find its rank.

II) Solve the equations $2x + 3y + z = 9$, $x + 2y + 3z = 6$, $3x + y + 2z = 8$ by the method of LU decomposition.

OR

B) I) Show that the equations $3x + 4y + 5z = a$, $4x + 5y + 6z = b$, $5x + 6y + 7z = c$ do not have a solution unless $a + c = 2b$. Solve the equations when $a = b = c = -1$.

II) State the condition of convergence of the Gauss-Seidel iterative method. Apply this method, up to six iterations, to solve the system defined by
$2x + 17y + 4z = 35$, $x + 3y + 10z = 24$, $28x + 4y - z = 32$.

2. A) I) Find the characteristic roots and the characteristic vectors of the matrix

$$A=\begin{bmatrix}-1 & 2 & -2\\ 1 & 2 & 1\\ -1 & -1 & 0\end{bmatrix}.$$

II) Verify the Cayley-Hamilton theorem for the matrix $A=\begin{bmatrix}7 & -1 & 3\\ 6 & 1 & 4\\ 2 & 4 & 8\end{bmatrix}$ and hence find A^{-1}.

OR

B) Find the rank, index, and signature of the following quadratic form by reducing it into a canonical form using orthogonal transformation $x^2+5y^2+z^2+2yz+6zx+2xy$.

3.A) State Lagrange's mean value theorem and give its geometrical interpretation.

Using Lagrange's mean value theorem, prove that $\left(\frac{b-a}{b}\right)<\log\left(\frac{b}{a}\right)<\left(\frac{b-a}{a}\right)$ for $0<a<b$.

Hence show that $\frac{1}{4}<\log\left(\frac{4}{3}\right)<\frac{1}{3}$.

OR

B) I) Using Taylor's theorem, express the polynomial $2x^3+7x^2+x-6$ in powers of $(x-1)$.

II) A window has the form of a rectangle surmounted by a semi-circle. If the perimeter is 40 feet, find its dimensions so that the greatest amount of light may be admitted.

4. A) I) If $\frac{x^2}{a^2+u}+\frac{y^2}{b^2+u}+\frac{z^2}{c^2+u}=1$, then prove that

$\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial u}{\partial y}\right)^2+\left(\frac{\partial u}{\partial z}\right)^2=2\left(x\frac{\partial u}{\partial x}+y\frac{\partial u}{\partial y}+z\frac{\partial u}{\partial z}\right)$, where *a, b, c* are constants.

II) If $x=e^u \sec v$, $y=e^u \tan v$, then prove that $\frac{\partial(u,v)}{\partial(x,y)}\cdot\frac{\partial(x,y)}{\partial(u,v)}=1$.

OR

B) I) Find the maximum and minimum distances from the origin to the curve $5x^2+6xy+5y^2-8=0$.

II) If $z=f(x,y)$ and $x=e^u \cos v$, $y=e^u \sin v$, then prove that $x\frac{\partial z}{\partial v}+y\frac{\partial z}{\partial u}=e^{2u}\frac{\partial z}{\partial y}$.

5. A) I) using double integration, find the smaller of the areas bounded by the ellipse $4x^2+9y^2=36$ and the straight line $2x+3y=6$.

II) Evaluate $\int_0^2 \int_0^{\sqrt{(2x-x^2)}} \frac{x\,dx\,dy}{x^2+y^2}$ by changing to polar coordinates.

OR

B) I) Evaluate $\int_0^\infty \int_x^\infty \left(\frac{e^{-y}}{y}\right) dy\,dx$.

II) Find the volume cut off from the cylinder $x^2+y^2=ax$ by the planes $z = 0$ and $z = x$.

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Subject Code: **R20CC1103**

I B.Tech - I Semester Supple Examinations, December-2023

Engineering Chemistry

Time: 3 Hours Max.Marks:**70** ranch: Common to CE,ME ,ECE.AIML &DS

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

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1. A) I) Explain ion-exchange process for softening water?
   II) Discuss biological oxygen demand and chemical oxygen demand.

   OR

   B) I) Discuss break point chlorination.
   II) Explain the principle involved in reverse osmosis process.

2. A) I) Discuss mechanism involved in cationic addition polymerization.
   II) Write notes on octane and cetane number.

   OR

   B) I) Explain proximate analysis of coal and discuss its significance.
   II) Explain injection moulding method for preparation of plastics.

3. A) I) Outline sol-gel method for preparing nanomaterials.
   II) Mention the applications of liquid crystals.

   OR

   B) I) Discuss fiber reinforced plastics.
   II) Explain chemical vapour deposition method for preparation of nanoparticles.

4. A) I) Explain the working of calomel electrode.
   II) Discuss environmental factors affecting rate of corrosion.

   OR

   B) I) Explain wet theory of corrosion.
   II) Explain working of primary and secondary battery taking an example for each.

5. A) I) Explain thin film and extreme pressure lubrication.
   II) Discuss refractoriness and porosity of refractories.

   OR

   B) I) Explain process involved in manufacture of Portland cement.
   II) Discuss the following properties of lubricant: viscosity, oiliness and saponification value.

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Subject Code: **R20CC1104**

I B.Tech - I Semester Supple Examinations, December-2023

Applied physics

Time: 3 Hours Max.Marks:**70**. Branch: CSE,IT,AI & CY

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

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1. A) I) Differentiate Fraunhofer and Fresnels diffraction. Derive the maxima and minima of the diffraction pattern for the Fraunhofer diffraction due to single slit. **(10M+4M)**
   II) Derive the expression for interference pattern due to transmitted light on thin film?

   OR

   B) I) Explain the working of quarter and half wave plates. Mention its applications. Calculate the thickness of (i) a quarter wave plate (ii) a half-wave plate, given that μ_e=1.533, μ_o=1.544 andλ=5000Å.. **(8 M)**
   II) What is double refraction explain principle construction and working of Nicol prism? **(6M)**
2. A) I) Discuss the construction and working of He-Ne laser system. Mention the advantages and drawbacks. **(8M)**
   II) Explain any four characteristics of laser radiation in detail. **(6M)**

   OR

   B) I) Derive the expression for numerical aperture of an optical fibre. Discuss the importance of acceptance angle and acceptance cone. **(8M)**
   II) Differentiate Spontaneous and stimulated emission of radiation. Which type of radiation is more suitable for emitting laser radiation? Why. **(6M)**
3. A) Define unit cell. What is atomic packing factor (APF). Prove that the $APF_{FCC} > APF_{BCC} > APF_{SC}$

   OR

   B) I) State and Explain the Bragg's law of diffraction. **(8M +6M)**
   II) On a simple cubic lattice of spacing =1, draw the [100], [010], [110], and [111] directions
4. A) I) Derive the differential and integral forms of Maxwell's electromagnetic equations. **(8M)**
   II) State and explain Meissner effect. How the Maxwell's equations contradicts Meissner effect **(6M)**

   OR

   B) Classify the magnetic materials based on the intensity of magnetisation, susceptibility and temperature dependence.
5. A) Assuming Schrodinger wave equation, derive energy of ground state and two excited energy levels for a particle enclosed in a potential well of infinite height.

   OR

   B) I) State and explain Hall effect. Derive the relation between Hall coefficient and Hall voltage with an experimental setup. **(8M)**
   II) Discuss the dual nature of matter. Derive the expression for de Broglie wavelength of matter waves and discuss its properties. **(6M)**

Narasaraopeta Engineering College (Autonomous)

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Subject Code: **R20CC1105**

I B.Tech - I Semester Supple Examinations, December-2023

Problem Solving Using C

Time: 3 Hours Max.Marks:**70.** Branch: CE,EEE,ECE,CSE,IT,AI,AIML,DS & CY

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

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1. a. i) What is an Algorithm? Write an algorithm for finding big among 3 numbers along with flow chart
   ii) Write short notes on numeric data types in C language. (7 M+7 M)

   (OR)

   b .i) Discuss briefly about Type Conversion and Type Casting with suitable examples. (7 M)
   ii) Define Variable. Write variable naming convention rules and give any three valid and three invalid variable names. (7 M)

2. a. i) What are decision control statements? Write a C language program to check whether the given year is leap year or not. (7 M)
   ii) Distinguish between 'break' and 'continue' statements. (7 M)

   (OR)

   b. i) What is recursion? What are the essential characteristics of any recursive function? Explain with suitable example. (7 M7 M)
   ii) What is the difference between 'Call by value' and 'Call by Reference'? Explain with an example.

3. a. i) What are 2D arrays? Write a C program for adding two matrices. (7 M)
   ii) What are various ways of initializing the 2-D arrays? Illustrate with examples. (7 M)

   (OR)

   b. i) Write a program to reverse a string without using string handling functions. (7 M)
   ii) Define an Array. Write a program to find the sum of all the elements of the given single dimensional array. (7 M)

4. a. i) What is a pointer? Explain the process of passing arguments to functions using pointers.(7 M)
   ii) Write short notes on the use and applicability of Enumerated Data Types. (7 M)

   (OR)

   b. i) Differentiate between structure and union and discuss their space requirement with suitable example. (7 M)
   ii) What are self referential structures? Explain with an example. (7 M)

5. a. i) Discuss the use of command line arguments with an example. (7 M)
   ii) Illustrate the process of writing data to a text file and reading data from the text file with the help of an example program. (7 M)

   (OR)

   b. i) Write short note on various kinds of errors that are likely to be occurred during file operations.
   ii) Define a File. Write short note on various file opening modes. (7 M+7 M)

Narasaraopeta Engineering College (Autonomous)
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Subject Code: **R20ME1106**

I B.Tech - I Semester Supple Examinations, December-2023

Problem Solving using Python

Time: 3 Hours | Max.Marks:**70**. | Branch: ME.

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

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1. A) I) What is flowchart and algorithm? Write differences between flowchart and algorithm. Give an example of flowchart and algorithm.
   II) Convert the following binary numbers to Decimal, Octal and Hexadecimal numbers.
   a) 1101 b) 1011 c) 010

   OR

   B) I) Give flowchart and algorithm for calculating maximum and minimum of first N numbers.
   II) Give flowchart and algorithm for Calculate the given number is prime or not?

2. A) I) What is data type? Define different type of data types with example. Why we use different data types in the Python programming language?
   II) Write a python program to find the square root of a given number.

   OR

   B) I) What are the different loop control statements available in Python? Explain with suitable examples.
   II) Write a program to print all the numbers from 1 to 1000 that are not divisible by 2, 3, 5, 7, 11, 13, 17 and 19.

3. A) I) Discuss recursive function. Write a python program to find the factorial of an integer using recursive function.
   II) Explain user defined functions with a suitable example.

   OR

   B) I) Explain basic mouse events, basic timer events?
   II) Explain how to plot Bar plots by using Turtle with an example.

4. A) I) What is dictionary? Write a python program to create following dictionary (Language Inventors) and print all keys and values of the dictionary?

Language	**Name**
C	Dennis Ritchie
CPP	James Gosling
Python	Guido van Rossum

II) Make list of any 20 numbers then using list operations do the following operations (a) Print first 5 number from created list. (b) Print last 5 numbers from created list. (c) Print alternate numbers from the created list.

OR

B) I) Compare the list and tuple with an example?

II) What is a file? What are file operations? What are the advantages of file handling?

5. A) I) What is the difference between a class and an object? Explain with suitable examples.

II) Write a program that has a class Point with attributes as the x and y coordinates. Make two objects of class and find the midpoint of the both the points.

OR

B) I) Explain following terms: (a) inheritance (b) polymorphism

II) Explain how exceptions can be handled in Python with an example. What are the advantages of using it?

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Subject Code: **R20CC1107**

I B. Tech - I Semester Supple Examinations, December-2023

Engineering Mechanics

Time: 3 Hours Max.Marks:**70.** Branch: Common to CE.ME.

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

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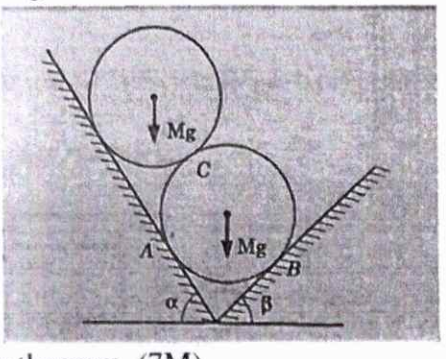
1. A) I) A sphere of mass "M" rests in a V-groove whose sides are inclined at angles α and β to the horizontal. Another identical sphere of the same mass "M" rests on the first sphere and is in contact with the side inclined at angle α. Find the reaction R_B on the lower sphere at point B. (7M)

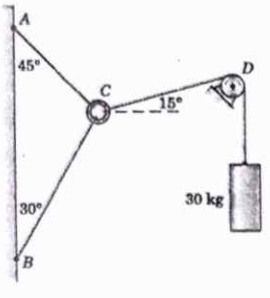


II) State and prove Varignon's theorem. (7M)

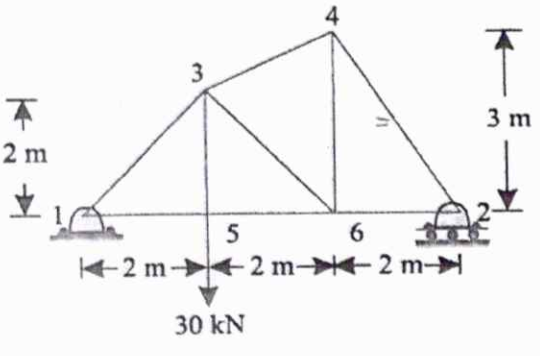
OR

B) I) State and prove Lami's theorem. (7M)

II) Three cables are joined at the junction ring C. Determine the tensions in cables AC and BC caused by the weight of the 30 kg cylinder. (7M)

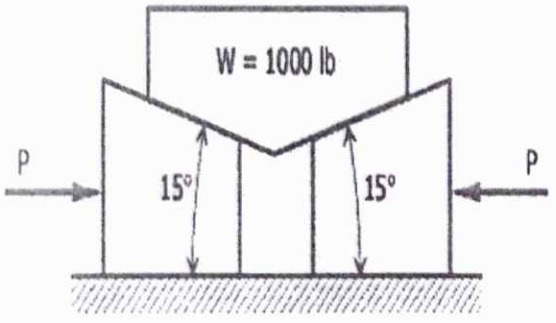


2. A) A plane truss of 6 m span is subjected to a point load of 30 kN as shown in figure Find the forces in all the members of the truss. (14M)

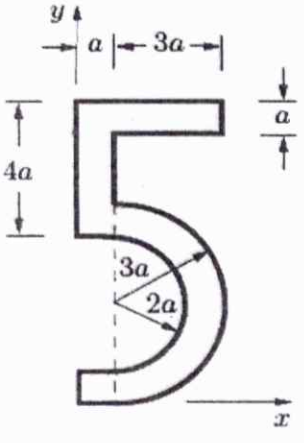


OR

B) What force P must be applied to the wedges shown in figure to start them under the block? The angle of friction for all contact surfaces is 10°. (Neglect self-weight of wedges) (14M)

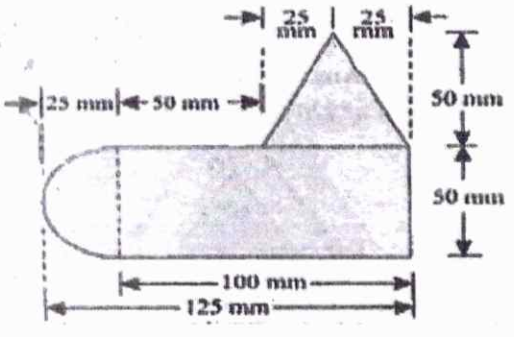


3. A) Determine the coordinates of the centroid C of the number shown in figure. (14M)

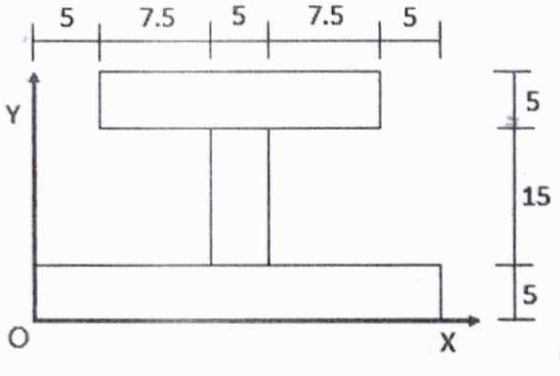


OR

B) A uniform lamina shown in the figure consists of a rectangle, semi-circle and triangle. Find its centre of gravity. (14M)



4. A) I) Find the area Moment of Inertia of the given figure with respect to the centroidal axis. (7M)



All dimensions are in cm

II) State and derive the expression for parallel axis theorem. (7M)

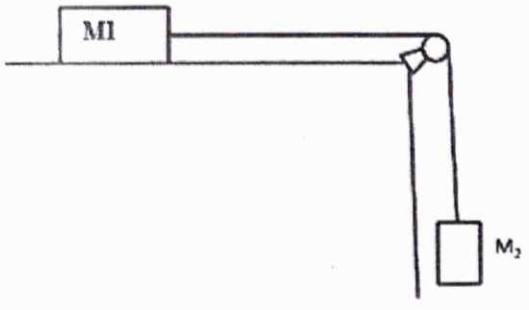
OR

B) I) State and derive the expression for perpendicular axis theorem. (7M)

II) Determine the mass moment of inertia of a slender bar of length 'l' and mass 'm'. (7M)

5. A) I) Derive work-energy equation for translation. (7M)

II) Two blocks of masses M1 and M2 are connected by a string as shown in Figure below Assuming the coefficient of friction between block M1 and the horizontal surface to be μ if the system is released from rest, find the velocity of the block A after it has moved a distance of 1 m Assume M1=100kg.and M2=150kg and μ =0.20. (7M)



OR

B) The acceleration of a particle in rectilinear motion is defined by the relation $a = 25 - 4s^2$ where 'a' is expressed in m/sec^2 and 's' is position coordinate in metres. The particle starts with no initial velocity at the position s = 0. Determine

i) the velocity when s = 3metres

ii) the position where the velocity is again zero

iii) the position where the velocity is maximum. (14M)

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Subject Code: **R20EC1108**

I B. Tech - I Semester Supple Examinations, December-2023

Engineering Graphics

Time: 3 Hours | Max.Marks:**70.** | Branch: ECE.

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

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1. A) I) To inscribe a regular pentagon of 30mm in a circle.
   II) The foci of an ellipse are 80mm apart and the minor axis is 55mm long. Determine the length of the major axis and draw the ellipse by arcs of circles method.

   OR

   B) Construct a hyperbola when the distance between fixed point and fixed line is 72 mm and the ratio of the distance between fixed point and fixed straight line is 5:4. Also draw a normal and tangent to a point 50 mm from the fixed point.

2. A) I) A point 30mm above xy line is the plan view of two points A and B. the elevation of A is 45mm above the H.P. while that of the point B is 35mm below the H.P. Draw the projections of the points and state their position with reference to the principal planes and the quadrant in which they lie.
   II) A line AB is 30 mm long and inclined at 30^0 to VP and parallel to HP. The end A of the line is 15 mm above HP and 20mm in front of VP. Draw the projections

   OR

   B) A line AB of 70 mm long has its end A at 10 mm above H.P and 15 mm in front of V.P. Its front view and top view measure 50 mm and 60 mm respectively. Draw the projections of the line and determine its inclinations with H.P. and V.P. Locate the traces of the line.

3. A) A circular plate of negligible thickness and 50mm diameter appears as an ellipse in the front view, having its major axis 50mm long and minor axis 30mm long. Draw its top view when the major axis of the ellipse is horizontal.

   OR

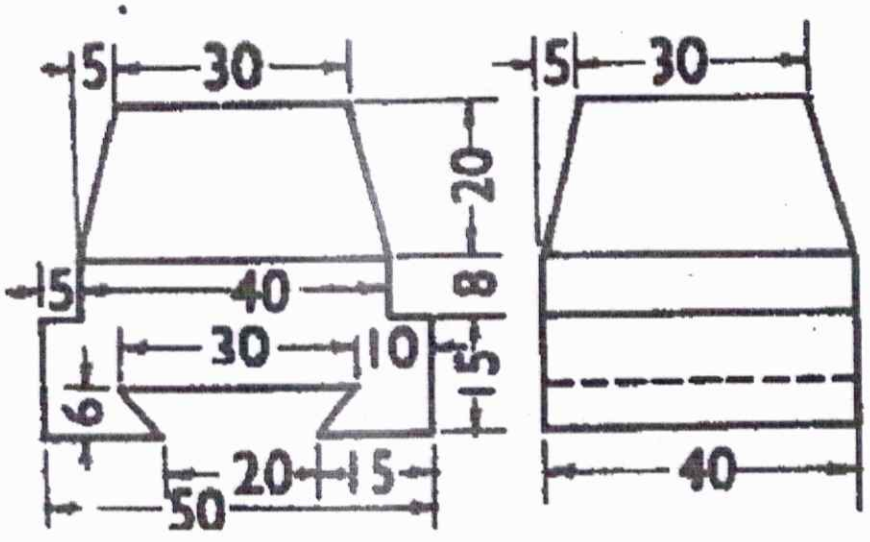
   B) Draw the projections of a regular hexagonal plate of 30 mm side, having one of its sides is in the H.P and inclined at 60^0 to the V.P., and its surface is making an angle of 45^0 with the H.P.

4. A) A pentagonal prism with side of base 30mm and axis 70mm long is resting with an edge of its base on HP, such that the rectangular face containing that edge is inclined at 60^0 to HP. Draw the projections of the prism when its axis is parallel to V.P.

   OR

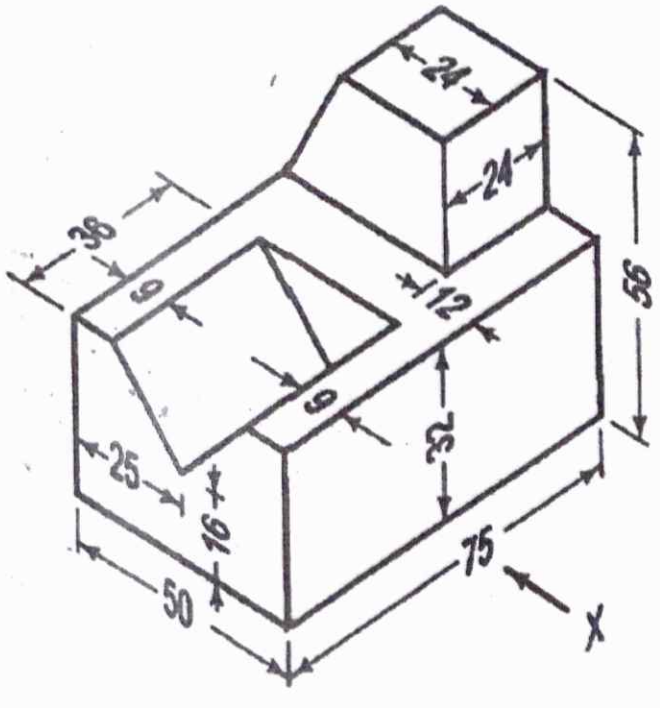
   B) A hexagonal pyramid of side of base 30 mm and axis 70 mm long is resting on its base on HP. such that a triangular face is parallel to V.P. Draw the projection of the pyramid if the axis makes an angle of 60^0 with HP.

5. A) Draw the isometric view of the object whose orthographic projections are shown in figure.



OR

B) Draw the (i) Front view (ii) Top view and (iii) Side view for the following figures.



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Subject Code: **R20EE1109**

I B.Tech - I Semester Supple Examinations, December-2023

Basics in Mechanical and Civil Engineering

Time: 3 Hours Max.Marks:**70**. Branch: EEE.

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

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1. A) I) Discuss about any two types of power plants for their applications. (7M)
   II) Explain a steam power plant layout with a neat sketch. (7M)

   OR

   B) Mention the basic principles of a gas turbine and Explain the working principle of a closed cycle gas turbine power plant with a neat sketch. (14M)

2. A) I) What are spur gears and how are they different from a helical gear. (7M)
   II) Explain briefly about the flat belt drive and list out its application. (7M)

   OR

   B) I) What are the different types of belt drives? Mention the advantages and disadvantages of V belt drive over Flat belt drive? (7M)
   II) Discuss the advantages, disadvantages and application of chain drive. (7M)

3. A) I) Explain the working principle of centrifugal pump with a neat sketch. (7M)
   II) Discuss about the impulse momentum principle. (7M)

   OR

   B) I) Explain the working principle of Reciprocating pump and its applications. (7M)
   II) Force exerted by jet on stationary curved plate. Explain with a neat sketch. (7M)

4. A) I) What is the contribution of civil engineering towards the society. Discuss (7M)
   II) Classify structures and buildings. Give some examples of building structures (7M)

   OR

   B) I) How is levelling determined in surveying? Explain. (7M)
   II) Discuss about the importance of Contour lines in Surveying. (7M)

5. A) I) Explain about the Geological classification of Rocks. (7M)
   II) What are the different types of cement? Explain about the manufacturing process of cement. (7M)

   OR

   B) I) Differentiate fine and coarse aggregates (7M)
   II) Explain how the quality of bricks is checked at the construction site. (7M)

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

Subject Code: R20CC1111

I B.Tech - I Semester Supple Examinations, December-2023
Electronic Devices and Logic Design
(AIML,CS & DS)

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	M
		Unit-I			
1	a	i) Show, discuss the characteristics and applications of a Zener diode as a voltage regulator.	1, 2	1	7M
		ii) Explain the working principle and applications of rectifiers with and without filters.	2	1	7M
		OR			
	b	i) Describe the characteristics and applications of an LED (Light-Emitting Diode). Write detailed answer for the similarity of LED characteristics to others devices.	2, 3	1	7M
		ii) Explain the V-I characteristics of a junction diode and how they are different in forward and reverse bias.	2	1	7M
		Unit-II			
2	a	i) Describe the construction and working principle of a Bipolar Junction Transistor (BJT) and explain the significance of its three terminals.	2	2	7M
		ii) Compare the Junction Field-Effect Transistor (JFET) and the Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET) in terms of construction, characteristics, and applications.	2	2	7M
		OR			
	b	i) Show the structural construction, characteristics of a Junction Field-Effect Transistor (JFET), and explain applications of a Junction Field-Effect Transistor (JFET).	2	2	7M
		ii) Discuss the characteristics and applications of the Common Base (CB), Common Emitter (CE), and Common Collector (CC) configurations of a BJT.	2, 4	2	7M
3		Unit-III			
	a	i) Apply De-Morgan's theorems to each expression and simplify the expressions: $\overline{(ABC)\,(EFG)} + \overline{(HIJ)\,(KLM)}$ and, $\overline{(A+B)\,(C+D)\,(E+F)\,(G+H)}$	4	3	7M
		ii) Perform the following using 6's complement: i) $(123)_7 + (41)_7$ and, ii) $(124)_7 - (44)_7$	4	3	7M

		OR			
	b	i) Show how a 2 input AND gate, OR gate, EX-OR gate and EX-NOR gate can be made transparent.	2	3	7M
		ii) Use a karnaugh map to simplify each function to a minimum sum-of-products form: i). $X = \overline{A}\overline{B}\overline{C} + A\overline{B}C + AB\overline{C}$ and ii). $X = D\overline{E}\overline{F} + \overline{D}\overline{E}\overline{F} + \overline{D}E\overline{F}$	3	3	7M
4		Unit-IV			
	a	i) Design a 4-bit binary counter using JK flip-flops.	4	4	7M
		ii) Explain the working of an *S-R* latch with a gate (clock) input, show the output waveforms.	2	4	7M
		OR			
	b	i) Explain the frequency divider circuit using D FF, also solve this: A *D*-latch with propagation delay 20 ns has its *Q* output connected to *D*-input. Show that pulses of 60 ns will start appearing as long as clock input remains 1.	2, 4	4	8M
		ii) Draw the R'-S' latch, labelling the R' and S' inputs and the Q and Q' outputs.	2	4	6M
5		Unit-V			
	a	i) Draw a logic diagram, truth table and output waveforms for a ripple down-counter with four flip-flops	2	5	7M
		ii) List applications of registers and differentiate between the Asynchronous and synchronous registers.	3	5	7M
		OR			
	b	i) Explain the working principle of an 3 bit Asynchronous Counter (Ripple Counter). Discuss its advantages and limitations compared to a Synchronous Counter.	2	5	7M
		ii) Design a shift register counter to generate a sequence length of 8 having self-start feature.	2	5	7M