Subject Code: R20CC1201

I B.Tech. - II Semester Supple Examinations, December-2023
Differential Equations and Vector Calculus
(CE,EEE,ME,ECE,AIML,DS & CY)

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

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

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1. A) I) Solve $(x y^3 + y) dx + 2(x^2 y^2 + x + y^4) dy = 0$.

   II) Radium decomposes at a rate proportional to the amount present. If 5% of the original amount disappears in 50 years, how much will remain after 100 years?

   OR

   B) I) Solve $e^y \left(\dfrac{dy}{dx} + 1 \right) = x e^x$.

   II) Solve $y \log y \, dx + (x - \log y) \, dy = 0$.

2. A) I) Solve $\dfrac{d^2 y}{dx^2} - y = x \sin x$

   II) Solve $\dfrac{d^2 y}{dx^2} - 2\dfrac{dy}{dx} + y = e^x \tan x$.

   OR

   B) I) Solve $x^4 \dfrac{d^3 y}{dx^3} + 2 x^3 \dfrac{d^2 y}{dx^2} - x^2 \dfrac{dy}{dx} = xy = \log x$.

   II) Solve $\dfrac{dx}{dt} = y + t, \dfrac{dy}{dt} = -2x + 3y + 1$.

3. A) I) Solve $(y^3 x - 2x^4)\dfrac{\partial z}{\partial x} + (2 y^4 - x^3 y)\dfrac{\partial z}{\partial y} = 9 z(x^3 - y^3)$.

   II) Form the partial differential equation by eliminating arbitrary functions from $z = yf(x) + xg(y)$.

   OR

   B) I) Find the partial differential equation by eliminating a, b, c from $\dfrac{x^2}{a^2} + \dfrac{y^2}{b^2} + \dfrac{z}{c^2} = 1$.

   II) Solve $(x - y)\dfrac{\partial z}{\partial x} + (x + y)\dfrac{\partial z}{\partial y} = 2 xz$.

4. A) I) Find the value n for which the vector $r^n \vec{r}$ is solenoidal, where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$.

   II) Find the directional derivative of $x^2 y^2 z^2$ at the point $(1, 1, -1)$ in the direction of the tangent to the curve $x = e^t, y = \sin 2t, z = 1 - \cos t$ at $t = 0$.

   OR

   B) I) Prove that $\nabla \cdot (\varphi \vec{A}) = (\nabla \varphi) \cdot \vec{A} + \varphi(\nabla \cdot \vec{A})$, where φ is a scalar point function.

   II) For a solenoidal vector $\vec{F}$, Show that $\nabla \times \nabla \times \nabla \times \nabla \times \vec{F} = \nabla^4 \vec{F}$.

5. A) Verify Green's theorem in the plane for $\oint_C \left[(3x^2 - 8y^2)\,dx + (4y - 6xy)\,dy\right]$, where

    C is the boundary of the region defined by $x=0, y=0, x+y=1$.

<div align="center">OR</div>

    B) Verify Stoke's theorem for the vector field $\vec{F} = (2x - y)\vec{i} - yz^2\vec{j} - y^2z\vec{k}$ over the upper half surface of $x^2 + y^2 + z^2 = 1$, bounded its projection on the XY-plane.

<div align="center">****</div>

Subject Code: R20CC1202

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

Numerical Methods and Statistics

(CSE,IT,AI)

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

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

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1. A) I) **Find** the real root of the equation $x - \cos x = 0$ by **applying** Bisection method.

   II) **Evaluate** the real root of the equation $x^4 + x^3 - 7x^2 - x + 5 = 0$ by **using** Newton-Raphson method near $x_0 = 2$.

   OR

   B) I) Find real root of $e^x \sin x = 1$ using regula falsi method.

   II) **Find** the real root of the equation $2x - \log_{10} x = 7$ nearby **using** Iteration method.

2. A) I) **State** Lagrange's formula of interpolation, **applying** unequal intervals.
   From an experiment , We get the following values of a function $f(x)$:

x	1	2	-4
$f(x)$	3	-5	4

   Represent the function $f(x)$ approximately by a polynomial of degree 2.

   II) **Apply** Gauss's backward interpolation formula to **find** $f(32)$ given that
   $f(25)=0.2707$, $f(30)=0.3027$, $f(35)=0.3386$, $f(40)=0.3794$.

   OR

   B) I) **Using** suitable interpolation formula, **find** the value of $y(7.5)$ from the following table

x	5	6	7	8
y	12	13	14	16

   II) **Using** Newton's divided difference formula, **evaluate** $f(8)$ and $f(15)$ given :

x	4	5	7	10	11	13
$f(x)$	48	100	294	900	1210	2028

3. A) I) **Find** the value of $\int_1^2 \frac{dx}{x}$ by Simpson's rule. Hence **obtain** approximate value of $\log_e 2$.

   II) **Tabulate** $y(0.1), y(0.2)$ and $y(0.3)$ using Taylor's series method given that
   $y' = y^2 + x$ and $y(0) = 1$

   OR

   B) I) Given $y' = x + y, y(0) = 1$, **find** the value of $y(0.4)$ take h=0.2 **using** Euler's method.

   II) **Compute** $y(0.1)$ and $y(0.2)$ by **applying** Runge-Kutta method of 4th order for differential equation $y' = xy + y^2, y(0) = 1$.

4. A) 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 $\sigma = 48$ 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.

II) **Determine** a 95% confidence interval for the mean of a normal distribution with variance 0.25, using a sample of n=100 values with mean 212.3.

OR

B) A professor's feelings about the mean mark in the final examination in "Probability" of a large group of students is expressed subjectively by normal distribution with $\mu_0 = 67.2$ and $\sigma_0 = 1.5$.

(a) If the mean mark lies in the interval (65.0, 70.0) **determine** the prior probability the professor should assign to the mean mark.

(b) **Find** the professor mean μ_1 and the posterior S.d σ_1 if the examinations are conducted on a random sample of 40 students yielding mean 74.9 and S.D 7.4.

Use S=7.4 as an estimateσ.

(c) **Determine** the posterior probability which he will assign to the mean mark being in the interval (65.0, 70.0) using results obtained in (b).

(d) **Construct** a 95% Bayesian interval forμ.

5. A) I) In a random sample of 125 cool drinkers, 68 said they prefer thumsup to pepsi. **Test** the null hypothesis P=0.5 against the alternative hypothesis P>0.5.

II) A sample of 400 items is taken from a population whose standard deviation is 10. The mean of the sample is 40. **Test** whether the sample has come from a population with mean 38. Also **calculate** 95% confidence interval for the population.

OR

B) I) Memory capacity of 10 students were tested before and after training. **State** whether the training was effective or not from the following scores.

Before training	12	14	11	8	7	10	3	0	5	6
After training	15	16	10	7	5	12	10	2	3	8

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.

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Subject Code: R20CC1203

I B.Tech - II Semester Supple Examinations, December-2023
Engineering Physics
(ME, CE)

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

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

Q.No		Questions	Marks
		Unit – I	
1	a	i) With the help of a neat diagram, describe the experimental arrangement to produce Newton's rings by reflected light. Prove that the diameter of dark rings is proportional to the square root of the natural numbers.	[10M]
		ii) The diameter of 10th dark ring in Newton's rings experiment is 0.7 cm. Find the radius of curvature of the lens when wavelength of light is 5893 A^0?	[4M]
		OR	
	b	i) Derive the conditions for maximum, minima and secondary maxima conditions in Fraunhofer diffraction due to a single slit.	[10M]
		ii) Find the thickness of quater-wave plate when the wavelength of light is equal to 5893A°, μ_o=1.486 and μ_e=1.554.	[4M]
		Unit – II	
2	a	i) Define population and population inversion.	[4M]
		ii) With the help of suitable diagram explain the principle, construction and working of ruby laser.	[10M]
		OR	
	b	i) Define acceptance angle and acceptance cone. Derive an expression for acceptance angle in terms of refractive indices.	[10M]
		ii) Calculate the acceptance angle and the numerical aperture of a given optical fiber, if the refractive indices of core and cladding are 1.543 and 1.468 respectively.	[4M]
		Unit – III	
3	a	i) Define basis and lattice parameters.	[4M]
		ii) Describe and draw the seven crystal systems with neat diagrams.	[10 M]
		OR	
	b	i) Deduce an expression for the inter plannar spacing in terms of Miller indices for a cubic structure.	[10M]
		ii) Draw the planes (001), (111)	[4M]
		Unit – IV	
4	a	i) Define magnetization and magnetic susceptibility.	[4M]
		ii) Draw a B-H curve for a ferro magnetic material and identify the remenant and coercive fields on the curve.	[10M]
		OR	
	b	i) Define Meissner effect and explain.	[6M]
		ii) What is Josephson's effect? Discuss the AC and DC Josephson's effect.	[8M]

		Unit – V	
5	a	i) Define absorption coefficient and reverberation time.	[4M]
		ii) Derive the reverberation time by using Sabine's formula.	[10M]
		OR	
	b	i) Describe Piezoelectric method for the production of ultrasonic waves.	[10M]
		ii) Young's modulus of quartz crystal is 8.2×10^{10} N/m^2 and density is 2650 Kg/m^3. Determine the frequency of ultrasonic waves produced when a quartz plate of thickness 3.5 mm is used.	[4M]

Subject Code: R20CC1204

I B.Tech - II Semester Supple Examinations, December-2023
Engineering Chemistry
(CSE, IT, AI&DS)

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

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

Unit-I

1. A) I) How can soften hard water by using the Ion-exchange method?   7M
   II) Describe the Break-point of chlorination.   7M

OR

   B) I) Illustrate the Hot Lime-Soda process.   7M
   II) Write a detailed note on BOD and COD.   7M

Unit-II

2. A) I) Describe the Free radical mechanism of addition polymerization. 7M
   II) Explain proximate analysis of the coal and give it' s significance. 7M

OR

   B) I) Illustrate the Injection and Compression moulding of plastic.   7M
   II) Distinguish the Octane and Cetane number.   7M

Unit-III

3. A) I) Give the classification and applications of CNTs.   7M
   II) Write a detailed note on FRPs.   7M

OR

   B) I) Distinguish TEM and SEM.   7M
   II) Describe the preparation of CNTs by Arc discharge and Laser ablation methods.   7M

Unit-IV

4. A) I) Write a detailed note on the Calomel electrode.   7M
   II) Distinguish the Electro plating and Electroless plating.   7M

OR

   B) I) Define primary cell and explain with suitable example.   7M
   II) Describe the mechanism of Chemical theory of corrosion.   7M

Unit-V

5. A) I) Write a detailed note on following properties of lubricants   7M
      a) Acid value b) Viscosity c) Flash and Fire point.
   II) Explain Failures of cement concrete with suitable chemical reactions.   7M

OR

   B) I) Describe the preparation of Portland cement.   7M
   II) Write a detailed note on following properties of the refractories 7M
      a) Refractoriness b) RUL c) Porosity.

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Subject Code: R20CC1205

I B.Tech. - II Semester Supple Examinations, December-2023
Applied Physics
(EEE,ECE,AIML & DS)

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

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

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1. A) I) Illustrate the theory of thin films with ray diagram and derive the conditions for constructive and destructive interference in the case of reflected system (14M)

OR

B) I) Give the theory of fraunhoffer diffraction due to single slit and hence obtain the condition for primary and secondary maxima (14M)

2. A) I) List out differences between spontaneous and stimulated emission? (4M)

II) Discuss the principle and working of ruby laser with the help of neat diagram (10M)

OR

B) I) Illustrate the propagation of optical signal through optical fiber and deduce the expression for Acceptance angle and Numerical Aperture. (10M)

II) Estimate the Numerical Aperture and Acceptance angle of an optical fibre, when light is launched into fibre through air and The refractive index of the core is 1.5 and the refractive index of the clad is 1.47. (4M)

3. A) I) Show that FCC is most closely packed of the three cubic structures by working out the packing factors. (14M)

OR

B) I) What are Miller indices? Explain the procedure to find miller indices with an example?

II) Derive Braggs law (10M+4M)

4. A) I) Analyze the concept of Hysteresis Loop in ferromagnetic materials and differentiate soft and Hard Magnetic materails (10M)

II) write the Maxwell's Electromagnetic Equations. (4M)

OR

B) I)Explain the concept of Meissener effect and differentiate Type-I and Type-II super conductors. (14M)

5. A) I) By applying Schrodinger time independent wave equation, show that energy of a particle in a one dimensional potential box is quantized. (10M)

II) Explain physical significance of wave function (4M)

OR

B) I) Explain Hall Effect and deduce an expression for the Hall co-efficient (10M+4M)

II) Mention any four differences of intrinsic semiconductor and extrinsic semiconductor

Subject Code: R20CC1206

I B.Tech. - II Semester Supple Examinations, December-2023
Problem Solving Using Python
(CSE,AI,IT,AIML,DS & CY)

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

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

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1. A) I) Explain Operator Precedence and Associativity.   7M
       II) Explain Operators with example each.   7M
       OR
    B) I) Explain different software development tools that are used for python. 7M
       II) Write a python program to print Armstrong number   7M

2. A) I) Explain different string operations with example   7M
       II) Write a recursive python function to print factorial 8 value.   7M
       OR
    B) I) Make use of Lambda functions.   7M
       II) Experiment with parameter passing to functions.   7M

3. A) I) Explain different list processing functions in python.   7M
       II) Differentiate between mutable and immutable data structure.   7M
       OR
    B) I) List any seven dictionary operations with suitable examples.   7M
       II) Write a python program to read first ten lines of a file.   7M

4. A) I) Explain different types of methods in Object Oriented Programming.   7M
       II) Illustrate the process of operator overloading with example.   7M
       OR
    B) I) Explain different types of Inheritance each with an example.   7M
       II) Write a python program for Overriding concept.   7M

5. A) I) Write a python program for url validation using regular expressions.   7M
       II) Explain different meta characters and its usage with example.   7M
       OR
    B) I) Write a Python program to check that a string contains only a certain set of
          characters (in this case a-z, A-Z and 0-9).   7M
       II) Explain about pattern match using regular expression with example.   7M

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Subject Code: R20CC1207

I B.Tech - II Semester Supple Examinations, December-2023
Engineering Drawing
(CE,ME)

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

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

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1. A) Draw a parabola if the distance of the focus from the directrix is 60 mm and also Draw a tangent and normal at any point 25mm on the Curve.

   OR

   B) The major axis of an ellipse is 150mm long and the minor axis is 100mm long. Find the foci and draws the ellipse by Arcs of circles method. Draw a tangent to the ellipse at a point on it 25mn above the major axis?

2. A) I) Draw the projections of the following.
   - i)　　Point D 20 mm above HP and 10 mm in front of VP.
   - ii)　　Point K 15 mm below HP and 12 mm behind VP.
   - iii)　　Point S 25 mm above HP and 25 mm behind VP.
   - iv)　Point L 10 mm in front of VP and 20 mm below HP.

   II)The front and top views of a straight line PQ measures 50 mm and 65 mm respectively.

   The point P is 10 mm above HP and 20 mm in front of VP. The front view of the line is

   inclined at $45°$ to the reference line. Find the true length and true inclinations.

   OR

   B) A line AB, inclined at $40°$ to the V.P., has its ends 50mm and 20mm above H.P. The length of its front view is 65mm and its V.T. is 10mm above the H.P. Determine the true length of AB, its inclination with the H.P. and its H.T.

3. A) A rhombus of diagonals 100 mm and 60 mm long, with the longer diagonal horizontal is the top view of a square of 100 mm long diagonals, with a corner on the ground. Draw its front view and determine the angle which its surface makes with the ground.

   OR

   B) ABCDE is a regular pentagonal plate of 40 mm side and has its corner A on H.P. The plate is inclined to H.P such that, the top view lengths of edges AB and AE are each 35 mm. The side CD is parallel to both the reference planes. Draw the projections of the plate and find its inclination with H.P.

4. A) A hexagonal pyramid, base 25mm side and axis 50mm long, has an edge of its base on the ground. Its axis is inclined at $30°$ to the ground and parallel to the V.P. Draw its projections.

   OR

   B) A Pentagonal pyramid base 30mm side and axis 60mm long is resting with its base on HP and edge of the base is perpendicular to VP. It is cut by a section plane perpendicular to VP and is inclined at $60°$ to the HP and bisecting the axis. Draw the development of pyramid.

5. A) Draw the (i) Front view (ii) Top view and (iii) Side view for the following figure.
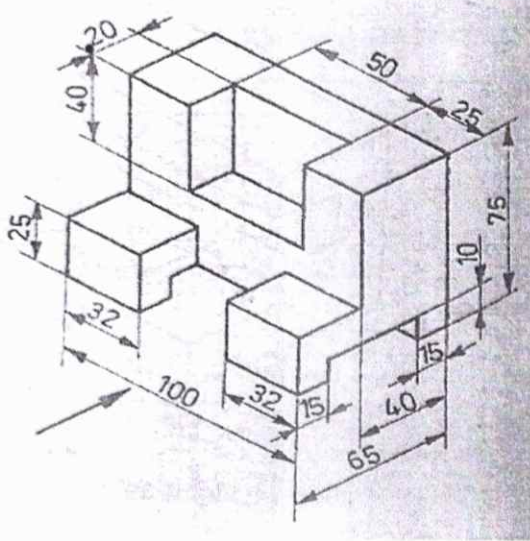
OR

B) Draw an isometric projection of a pentagonal prism of base edges 30 mm and height 60 mm. The axis being vertical and one of the rectangular face parallel to V.P.

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Subject Code: R20CC1208

I B.Tech - II Semester Supple Examinations, December-2023
Electronic Devices and Logic Design
(CSE,IT,AI)

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

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

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1. A) I) Draw and explain the V-I characteristics of Zener Diode along with wave forms
    II) Write a neat diagram and explain working principle of full wave bridge rectifier [7+7]

    OR

    B) I) Draw and explain VI Characteristics of PN Junction diode. Write current equation of PN Junction   [7+7]
    II) With neat diagram, explain bridge rectifier. Draw the input and output waveforms

2. A) I) Draw the input & output characteristics of a NPN transistors in CE configuration & explain[7+7]
    II) Explain the working of FET with neat diagram and relevant characteristics. Indicate each region of the characteristics

    OR

    B) I) Draw the drain characteristics of a n-channel JFET and Explain it
    II) List out few Comparison between JFET and MOSFET. [7+7]

3. A) I) Generate the Hamming code word for the message 1110010111. [7+7]
    II) Perform the following subtraction in binary using 1's and 2's complement
        method: $(677)_{10} - (899)_{10}$

    OR

    B) I) Simplify the following using K- map and implement the same using NAND gates.
        $Y (A, B, C) = \sum(0,2,4,5,6,7)$ [7+7]
    II) Convert the given expression in standard POS form y=A.(A+B+C)

4. A) I) Design BCD to gray code converter and realize using logic gates.
    II) Implement full adder using decoder and OR gates. [7+7]

    OR

    B) I) what do you mean by triggering? Explain the various triggering modes with examples.
    II) Draw the circuit of a JK master slave flip-flop with active high clear and active low preset and explain its operation. [7+7]

5. A) I) Draw the block diagram of Bidirectional Shift Registers and explain its operation [7+7]
    II) Draw the circuit diagram of Ring Counter and explain its operation

    OR

    B) I) Draw the circuit diagram of Universal Shift Registers and explain its operation
    II) write short notes on Synchronous Counter in detail [7+7]

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Subject Code: R20EE1209

I B.Tech. - II Semester Supple Examinations, December-2023
Electronic Devices and Circuits
(EEE)

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

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

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1. A) I) State and explain continuity equation

   II) Estimate the values of resistivity of an intrinsic germanium at 300 K. Given that intrinsic concentration=$2.5X10^{13}$ cm3 , electron mobility=3800 cm2 /vs, hole mobility=1800 cm2 /vs, electron charge=$1.6x10^{-19}$ C and also derive the expression for conductivity in a intrinsic semiconductor   [7+7]

   OR

   B) I) With a neat sketch explain the phenomena of Hall Effect in semiconductors

   II) Define i) transient capacitance ii) Diffusion capacitance [7+7]

2. A) I) Draw and explain VI characteristics of Si & Ge diode [7+7]

   II) Write a neat diagram and explain working principle of full wave bridge rectifier

   OR

   B) I) Draw and explain VI Characteristics of PN Junction diode. Write current equation of PN Junction [7+7]

   II) With neat diagram, explain bridge rectifier. Draw the input and output waveforms

3. A) I) Draw the input & output characteristics of a NPN transistors in CB configuration & explain

   II) For a silicon, α=0.995 emitter current is 10mA & leakage current I_{co}=0.5µA. Find I_C ,I_B ,β, and I_{CEO} [7+7]

   OR

   B) I) Compare three transistor Configurations

   II) Derive an expression between transistor parameters (α, β, γ)? [7+7]

4. A) I) Define stability factor and discuss the factors that cause in stability of biasing circuit

   II) Determine the operating point for a silicon transistor biased by fixed bias method with β=100, RB=500 KΩ, Rc=2.5 KΩ and Vcc=20 V and draw DC load line [7+7]

   OR

   B) I) Explain any one bias compensation method

   II) Derive the stability factor for S and S' for fixed bias circuit [7+7]

5. A) I) Explain working of two transistor model of an SCR and Draw the SCR Characteristics

   II) Explain the working of FET with neat diagram and relevant characteristics. Indicate each region of the characteristics [7+7]

   OR

   B) I) Draw the drain characteristics of a n-channel JFET and Explain it.

   II) Draw the equivalent circuit and V-I Characteristics of UJT and explain it [7+7]

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Subject Code: R20CC1210

I B.Tech - II Semester Supple Examinations, December-2023
Data Structures
(EEE, ECE)

Time: 3 hours   Max. Marks: 70

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

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1. A) I) Write a recursive program for factorial calculation.   7M
       II) Explain different types of operations in Data Structures.   7M
                                  OR
    B) Explain design and analysis of algorithms? Write an algorithm for GCD.   14M

2. A) I) Write an algorithm for Quick Sort.   7M
       II) Utilize the elements 12,31,25,8,32,17,40,42 to perform merge sort. 7M
                                  OR
    B) I) Analyse the time complexity of Insertion sort.   7M
       II) Construct an algorithm for Heap sort.   7M

3. A) Construct postfix expression for given infix expression
       K + L - M*N + (O^P) * W/U/V * T + Q   14M

                                  OR
    B) I) Explain any two applications of queues.   7M
       II) Illustrate Insertion and Deletion operations of Circular Queues.   7M

4. A) I) Differentiate between Single and Double Linked list.   7M
       II) Construct an algorithm for inserting an element at specified position of linked list.7M
                                  OR
    B) I) Write an algorithm for deleting an element at the end of Double link list.   7M
       II) Explain insertion of an element at specific position in circular link list.   7M

5. A) I) Explain inserting an element in avl tree.   7M
       II) Explain different types of graphs.   7M
                                  OR
    B) I) Explain tree traversal algorithm with an example.   7M
       II) Illustrate BFS algorithm with an example.   7M

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Subject Code: R20ME1211

I B.Tech. - II Semester Supple Examinations, December-2023
Material Science and Metallurgy
(ME)

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

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

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1. A) I. List the four types of invariant reactions in general

  II) Explain the mechanism of crystallization in pure metals. What factors favour fine grain size?

OR

   B) I) Explain the steps for determining Miller indices for crystallographic planes.
II) Draw Iron Carbide equilibrium Diagramand mark on it all salient temperatures,comosition and phases inloved

2. A) I) Give the microstructure, composition, properties and applications of the following
   a) Nodular Cast Iron   b) Grey cast iron.

   II) Write the classification of steel? and Explain
OR
   B) I) Explain in detail the properties and applications of medium carbon steel?
   II) Explain the production of malleable cast iron

3. A) I) What is hardenability? Describe hardenability test. What are the factors affecting hardenability?
   II) Compare annealing and normalizing. When do you use them
OR
   B) I)Explain 'Nitriding' and 'flame hardening' processes.
   II) Draw TTT diagram for an eutectoid steel and indicate transformation products.

4. A) I) Explain the properties and applications of aluminum and its alloys?
   II) Explain the properties of alpha-beta titanium alloys?
OR
   B) I) Write the properties of alpha titanium alloy? Explain its typical applications
   II) Write in detail about the properties and applications of copper and its alloys?

5. A) I) Give at least two applications of composites in aerospace industry. What properties make them suitable for the above application.
   II) What is powder metallurgy? Explain in detail.
OR

   B) I) Give two examples for ceramic materials. Explain the properties of ceramic materials?
   II) Explain the manufacture of fiber reinforced composites?

Subject Code: R20CE1212

I B.Tech - II Semester Supple Examinations, December-2023
Elements of Mechanical and Electrical Engineering
(CE)

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

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

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1. A) I) State the assumptions made in an ideal cycle analysis of gas turbines.   7M
   II) Explain briefly simple gas turbine and their parts.   7M

   OR

   B) I) Explain briefly mechanism of simple vapour compression refrigeration system with neat sketch.   7M
   II) Discuss briefly types of I.C Engines and its applications.   7M

2. A) I) Explain briefly V- belt drive and rope drive systems.   7M
   II) Discuss relative advantages and disadvantages of chain and belt drives.   7M

   OR

   B) Explain briefly open flat and cross belt drives and classify the gear systems and its applications.   14M

3. A) I) Explain spot welding and projection welding of resistance welding with neat sketches.   7M
   II)Describe the carbon arc and gas metal arc welding's with neat sketches.   7M

   OR

   B) I) Explain KVL and KCL with neat sketches.   7M

   II)Derive the expression for Star- Delta conversion.   7M

4. A) I) Classify the DC Generators with neat circuit diagrams.   7M
   II)Derive the EMF equation of a DC Generator.   7M

   OR

   B) I)Describe the working of a 3-point starter with neat sketch.   7M
   II) Explain the working principle of a DC Motor with neat sketch.   7M

5. A) I) Explain the working principle of a Transformer with neat sketch.   7M
   II)Derive the EMF equation of a transformer.   7M

   OR

   B) I)Explain the working principle of 3phase Induction Motor.   7M
   II)List out the applications of single-phase Induction Motor.   7M

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Subject Code: R20EE1213

I B.Tech. - II Semester supplementary Examinations, December 2023
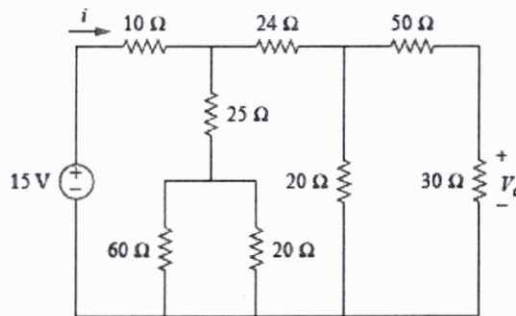**Electrical Circuit Analysis-I**
(EEE)

Time: 3 hours   Max. Marks: 70

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

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1. A) I) Distinguish between independent and dependent sources [6M]
       II) Find *i* and *Vo* in the circuit in Fig. [8M]

OR

   B) I) Describe different types of active elements and passive elements in the circuit analysis. [8M]
       II) Determine the currents i_1 and i_2 in the circuit shown below [6M]
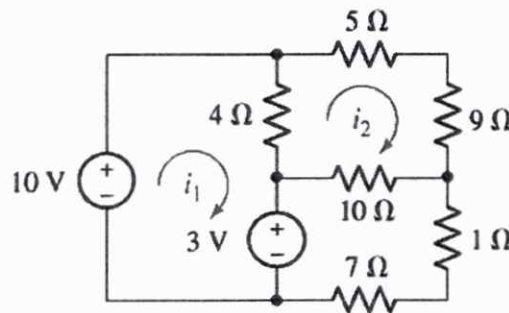
2. A) I) Calculate RMS value, average value, form factor for the saw waveform shown in Figure [9M]
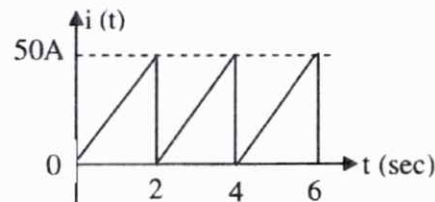
   II) Define the following terms   [5M]
       (i) Instantaneous value   (ii) peak value
       (iii) peak to peak value   (iv) Time Period   (v) Frequency

OR

   B) I) Explain real power, reactive power and apparent power and power factor [7M]

II) Derive an expression for the current, impedance, average power for a series RC circuit excited by a sinusoidally alternating voltage and also find the power factor of the circuit. Draw the phasor diagram. [7M]

3. A) I) What is resonance? Derive a expression for half power frequencies in series RLC circuit [7M]

II) A series R–L–C circuit has a supply input of 5 volts. Given that inductance, L = 5mH, resistance, R = 75Ω and capacitance, C = 0.2 μF, determine
(i)   the resonant frequency,
(ii)   the value of voltage across the capacitor at the resonant frequency,
(iii)   the frequency at which the Potential difference across the capacitance is a maximum,

[7M]

OR

B) I) Explain self-inductance and Mutual-inductance? [7M]

II) How do you use dot convention? For mutually coupled parallel coils show that

$$L_{eq} = \frac{L_1 L_2 - M^2}{L_1 + L_2 - 2M}$$

[7M]

4. A) I) Explain about superposition principle with example [7M]

II) Find the Thevenin equivalent circuit of the following circuit to the terminals a and b [7M]

OR
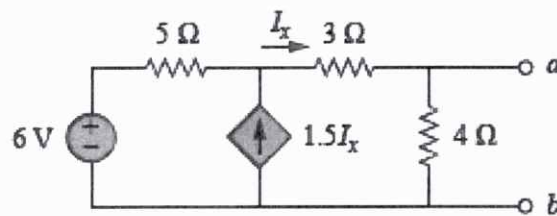
B) I) State and Explain compensation theorem [7M]

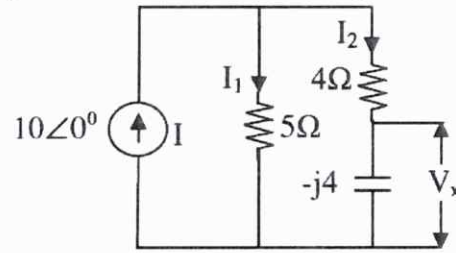II) Find the Norton equivalent circuit for the circuit in Fig. [7M]
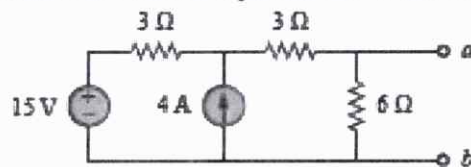
5. A) Use superposition theorem, determine V_0 in the following circuit [14M]

OR
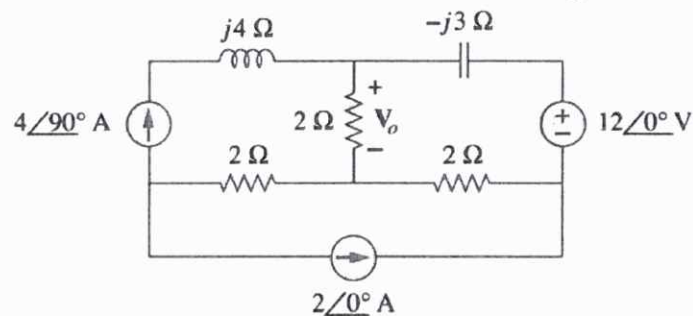
B) I) State and explain Maximum Power Transfer theorem. [7M]

II) Verify the reciprocity theorem for the following circuit shown in Figure. [7M]
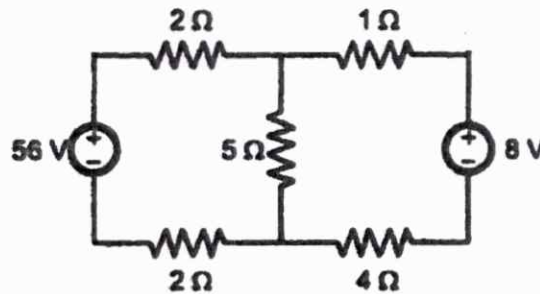

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Subject Code: R20ME1214

I B.Tech. - II Semester Supple Examinations, December 2023
Elements of Electrical and Electronics Engineering
(ME)

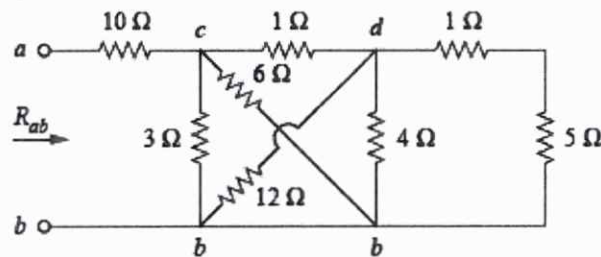**Time: 3 hours**   **Max. Marks: 70**

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

----

1. A) I) State and explain Kirchhoff's laws[7M]

   II) Find current through $5\,\Omega$ resistor for the circuit shown below? [7M]

   OR

   B) I) Explain about source transformation technique [7M]

   II) Calculate the equivalent resistance R_{ab} in the circuit in Fig [7M]

2. A) I) Derive the EMF equation of DC generator [7M]
      II) Explain the different types of DC generators [7M]
   OR
   B) I) Derive an expression for the torque equation of a dc motor [7M]
      II) What are the different methods speed controls of DC motor? Give the advantages and disadvantages   [7M]

3. A) I) Explain with sketches the constructional features of single phase transformer.
   [7M]

   II) List and explain various losses in a single phase transformer [7M]
   OR
   B) I) Explain the principal of operation of the 3-phase induction motor. [7M]
      II) What are the applications of single phase induction motor [7M]

4. A) I) Explain the differences between intrinsic and extrinsic semiconductors. [7M]
      II) Discuss the operation of a PN junction diode and also explain its V-I Characteristics [7M]

OR

B) I) Explain the operation of half wave rectifier with the help of neat diagram. [7M]

II) How is Zener diode used as a voltage regulator? [7M]

5. A) I) Explain the input and output characteristics of a transistor in CB configuration
[7M]

II) Explain the input and output characteristics of a transistor in CC configuration
[7M]

OR

B) I) Explain how transistor can be used as an amplifier. [7M]

II) Explain the comparison between CE, CB and CC configurations [7M]

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Subject Code: R20EC1215

I B.Tech - II Semester Supple Examinations, December-2023
Network Analysis
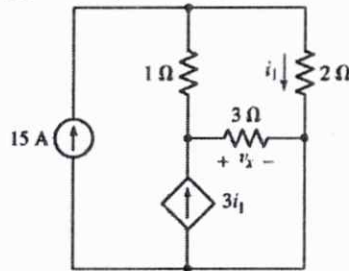### (EC)

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

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

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1. A) I) Define the following i) Electric charge ii) Current iii) Electric energy and iv) Potential
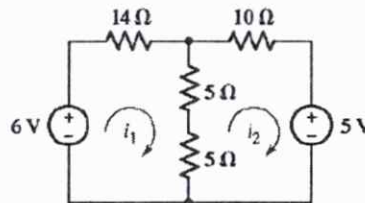
   II) Determine the power supplied by the dependent source shown in figure

OR

   B) I) Explain about star to delta conversion.

   II) Determine the currents i1 and i2 in the circuit shown below.

2. A) I) Define the following terms associated with periodic functions: Time period, Angular velocity and frequency

   II) Calculate the rms and average values for the Voltage wave form shown:
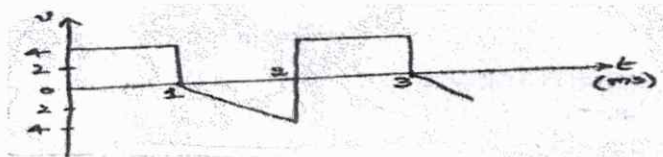
OR

   B) I) What is coupling coefficient? Derive the expression for it.

   II) A choke coil (R –L) is connected in series with a 25 µF capacitor. This series combination is connected across a supply voltage of 230V. the circuit draws 55A when the resonance frequency is 50 Hz. Calculate inductance of the coil, and ii) the voltage across the capacitor

3. For an RC series circuit, a sinusoidal voltage v (t) Vm sinωt is applied at t=0. Find the expression for transient current using both differential equation approach and Laplace transform approach.

OR

B) I) State and explain Norton's theorem.

II) Find the maximum power across A and B
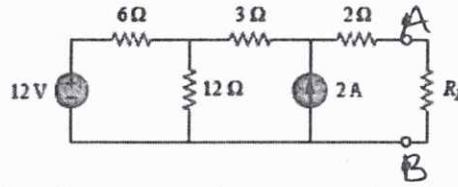
4. A) I) Derive the expression for resonant frequency of series resonant circuit.

II) A series connected circuit has R = 4 _ and L = 25 mH.

(i) Calculate the value of C that will produce a quality factor of 50.

(ii) Find $\omega 1$, $\omega 2$ and bandwidth.

OR

B) I) Explain about Z-parameters of a two port network.

II) Find the transmission parameters of the following two port network:
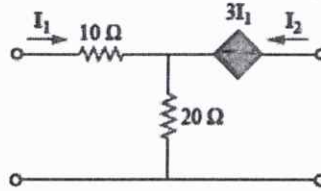
5. A) I) Explain the transient response of Series RC circuit when dc voltage is applied to the circuit.

II) For the figure shown, the dc voltage is applied to the circuit keeping the switch K open so that the steady state is reached. Determine the complete response for the circuit after closing the switch K.
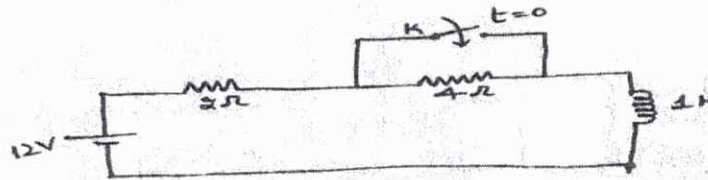
OR

B) I) Discuss about step response of an RC circuit.

II) Calculate the voltage v(t) shown in figure, given an initial current I (0^-) = 1A using Laplace transform method.

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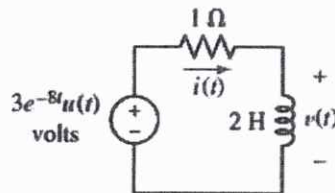
Subject Code: R20CE1216

I B.Tech. - II Semester Supple Examinations,December-2023
Elements of Building Science
(CE)

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

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

Q.No.			Questions	Marks
			Unit-I	
1	a	i.	What are the qualities of good building stones? Discuss them?	[7M]
		ii.	Describe in detail how lime is manufactured?	[7M]
			OR	
	b	i.	Write different classification of bricks and their uses in brief?	[7M]
		ii.	Explain the constituents of lime stone..	[7M]
2	a	i.	Explain the classification of wood used in buildings in detail?	[14M
		ii.	What do you understand by natural seasoning of wood? What is its purpose?	
			OR	
	b	i.	Explain briefly about the manufacture of tiles.	[7M]
		ii.	State the general properties and importance of glass.	[7M]
			Unit-III	
3	a	i.	Define the terms in brick masonry: Header, Stretcher, Quoin, Queen closure, King closure, Course, Bed joint and Facing.	[7M]
		ii.	Define Shallow foundation? Write about classification of foundations.	[7M]
			OR	
	b	i.	Compare stone Masonry with brick masonry with neat sketches	[7M]
		ii.	Write short notes on: (a) Lean-to-roof. (b) Collar roof.	[7M]
			Unit-IV	
4	a	i)	Explain the principles of building planning.	[7M]
		ii)	Write about general fire safety requirements in detailed.	[7M]
			OR	
	b	i)	Write down the necessity of ventilation and explain the types of ventilations	[7M]
		ii)	Explain the types of lighting in working places.	[7M]

Unit-V

5	a	i. Write about Open space requirements & Built up area limitations as per NBC	[7M]
		ii. Write about a)Floor area ratio (FAR), b) Floor space index (FSI)	[7M]
		OR	
	b	i) Explain the classification of buildings as per NBC	[7M]
		ii) What are Requirements of different parts and their grouping in building planning?	[7M]

Subject Code: R20EC1217

I B.Tech. - II Semester Supplementary Examinations, December 2023
Problem Solving Using Python
(ECE)

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

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

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1. A) I) List and explain the functionalities of OS.   7M
   II) Draw a flow chart to find GCD of two numbers.   7M

   OR

   B) I) List and draw different types of symbols used in Raptor. Also draw a flow chart to find maximum of two numbers.   7M
   II) Explain different types of data formats in computers.   7M

2. A)
   I) Define an identifier. List the rules to name an identifier. List the different types of operators supported by Python.   7M
   II) Write a program to enter the marks of a student in five subjects. Then calculate the total and aggregate, and display the grade obtained by the student. If the student scores an aggregate greater than 75%, then the grade is Distinction. If aggregate is 60>= and <75 then the grade is First Division. If aggregate is 50>= and <60, then the grade is Second Division. If aggregate is 40>= and <50, then the grade is Third Division. Else print the grade is fail.   7M

   OR

   B)
   I) List and explain different types of selection control statements in Python. Give Examples.   7M
   II) Write a program to calculate salary of an employee given his basic pay(to be entered by the user), HRA=10% of basic pay, TA=5% of basic pay. Define HRA and TA as constants and use them to calculate the salary of an employee.   7M

3. A)
   I)Write the uses of recursive functions. Write a program to print Fibonacci sequence using recursion.   7M
   II) Illustrate timer events in Turtle with simple example.   7M

   OR

   B)
   I) Illustrate the use of lambda function in Python with example.   7M
   II) Illustrate key press events in Turtle with simple example.   7M

4. A)

    I) Illustrate the use of set in Python with example.   7M
    II) List different types functions used in file handling. Give their prototypes and
    illustrate with simple example.   7M

OR

B)

    I) Explain slicing operations on lists with example.   7M
    II) Write the procedure of reading and writing the data from/into file. Explain with
    simple example.   7M

5. A)

    I) Illustrate the concept of operator overloading with simple example.   7M
    II) Write a Program that demonstrates the usage of Multi-Level Inheritance in
    Python.   7M

OR

B)

    I) Explain run-time polymorphism with an example program.   7M
    II) Demonstrate the use of try, except, else and finally keywords in Python with an
    example.   7M

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

Sub Code: R20CC1218   **TECHNICAL AND COMMUNICATIVE ENGLISH-II**
Time: 3 hours   (CS,DS & AIML)   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) Assess the readiness exhibited by Nellie Bly to take up the world travel.	3	1	8M
		ii) Fill in the blanks with the right options given in the brackets: Sandhya is looking for a pair of walking _____ (footwear/ shoes) for an excursion with her friends. She is looking forward to the _____ (journey/ journeys) as she has heard a lot about the beautiful _____ (scenery/ sceneries) of Shimla. She is excited about the trip. She is eager to meet a lot of new _____ (people/ peoples) and make new friends. Sandhya hopes to create memorable _____ (experience/ experiences) and gain _____ (knowledge/ knowledges) about diversity in our country.	3	4	6M
		OR			
	b	i) Discuss the hurdles Nellie Bly overcame to make her wish come true.	3	1	8M
		ii) Write a brief profile of someone you admire using the following prompts. Occupation, Iinterests, Qualities you like, Accomplishments, His/Her impact on you.	6	2	6M
		UNIT-II			
2	a	i) Demonstrate the traits of Mary Smith's character as an ideal teacher.	3	1	8M
		ii) Write a coherent paragraph of 150 words on "Pros and Cons of playing national anthem in the cinemas".	6	2	6M
		OR			
	b	i) How was Mr. Ellis' method of teaching different from that of the author's predecessors?	6	2	8M
		ii) Fill in the blanks with suitable *articles* and put a 0/zero if an article is not needed in a blank: After my uncle retired from work he moved to _____ apartment in a retirement village so that he could spend time with other elderly people. He used to be _____ agent of the Central Bureau of Investigation. He once saved _____ MP's niece, _____ one-year old girl who was kidnapped. Another time, he, along with his team, captured _____ dangerous criminal after finding his hiding place following a month-long stake-out. He has many _____ interesting stories to share and I enjoy listening to him. So, I often visit him.	3	3	6M
		UNIT-III			
3	a	i) Explain the benefits and issues that are relating to "Distributed work"	3	1	8M
		ii) Correct the error in the following sentences and rewrite them. i. I lived in Calcutta since 1985. ii. The train leave the station before I reached there. iii. I have written a letter to her last Friday. iv. I am reading Ramayana for the last six days. v. The new hotel has been opened last Saturday. vi. He had gone to Chennai last month.	3	3	6M

		OR			
		i) Do you prefer remote work? Why / Why not?	3	1	8M
	b	ii) Fill the blanks with suitable verb forms: i) She --------------(sing) a song last evening. ii) Mom can't answer the phone call right now, she -------------- (cook). iii) I -------------(read) this article before. iv) Ravi --------(practice) the music every day. v) John ------------(study) when her friend called last evening. vi) He -----------(complete) the project by the end of April.	3	3	6M
		UNIT-IV			
4	a	i) Estimate the value of H G Wells's observations concerning the uncertainties of progress.	3	1	8M
		ii) Write the **Antonyms** for the following words. i) Diverges ii) Match iii) Theoretically iv) Fantasy v) Devoid vi) Seldom	3	4	6M
		OR			
	b	i) Explain H.G. Wells' idea of 'mechanical revolution' and its consequences.	3	3	8M
		ii) Complete the following sentences using appropriate degree of **adjectives** given in the parenthesis: i. She is _____ (pretty) than her sister. ii. Lily is considered _____ (clever) girl in the team. iii. Supriya is the_____ (intelligent) student in the class. iv. Take the _____ (short) of the two routes. v. If you want to be much _____ (healthy) you should exercise every day. vi. 6. This is the _____ (interesting) novel I have ever read.	3	4	6M
		UNIT-V			
5	a	i) Defend Sui Sin Far's stand when she says "Individuality is more than nationality".	3	5	8M
		ii) Write an essay about 250 words on 'Engineering- a professional course that requires application of knowledge.'	6	2	6M
		OR			
	b	i) Does discrimination still exist in the society? Support your answer with relevant details.	3	1	8M
		ii) Read the text given below find one **error** and rewrite the sentences. An invention is an unique or novel device, method, composition or process. The invention is a process within a overall engineering and product development process. It may be an improvement upon a machine, a product, or a new process to creating an object or a result. An invention that achieve a completely unique function or result may be a radical breakthrough. Some inventions can being patented. A patent legally protects the intellectual property rights of the inventor and recognises that a claimed invention is actually an invention. The rules and requirements for patenting an invention vary from country for country and the process of obtaining a patent is often expensive. Inventions often extend the boundaries of human knowledge, experience or capability.	3	3	6M

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