GROUP A

MODEL QUESTION PAPER

SEMESTER 1

MODEL QUESTION PAPER

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B. TECH DEGREE EXAMINATION, DEC 2024

Course Code: GAMAT101

Course Name: MATHEMATICS FOR INFORMATION SCIENCE-1

Max. Marks: 60 | Duration: 2 hours 30 minutes

PART A

		Answer all questions. Each question carries 3 marks	CO	Marks
1		Evaluate $\lim_{x\to 3}\left(\frac{\sqrt{x+1}-2}{x-3}\right)$.	CO1	(3)
2		At what points are the following functions $y = \|x-1\| + sinx$ continuous?	CO1	(3)
3		Find and sketch the level curve of the function $f(x,y) = x^2 + y^2$ passing through the point (2,0).	CO2	(3)
4		Find the values of $\partial f/\partial x$ and $\partial f/\partial y$ at the point (4, -5) if f(x, y)=x^2+3xy+y-1.	CO2	(3)
5		Find the directional derivative of $f(x,y) = xy$ at the point (1, 2) in the direction of the vector $u = \sqrt{3}i + j$.	CO3	(3)
6		Find the local extreme values of f(x, y) = y^2-x^2	CO3	(3)
7		Explain the method of steepest descent.	CO4	(3)
8		Maximize f= 5x_1+25 x_2 subject to the constraints x_1-3x_2≥ −6, x_1+ x_2≤6, x_1,x_2≥0	CO4	(3)

PART B

Answer any one full question from each module. Each question carries 9 marks

Module 1

9	a)	Find the first and second derivatives of $f(x) = ln\,(x+1)$	CO1	(2)
	b)	Find the derivative of $y = tan\,(5 - sin2x)$	CO1	(3)
	c)	Linearize $f(x) = x^2 + 2x$ *at* $x = 0.1$	CO1	(4)
10	a)	Use Implicit differentiation to find $\frac{dy}{dx}$ in $x^3 + y^3 = 18xy$	CO1	(2)
	b)	Find the equations of the tangent and normal lines to the curve $y = x^2$ at point (1,1)	CO1	(3)
	c)	Determine the concavity of $f(x) = -2x^3 + 6x^2 - 3$	CO1	(4)

Module 2

11	a)	Find $\lim_{(x,y)\to(0,0)} \frac{x^2-xy}{\sqrt{x}-\sqrt{y}}$	CO2	(4)
	b)	Show that f(x, y)=$\begin{cases} \frac{2xy}{x^2+y^2} & (x,y) \neq (0,0) \\ 0 & (x,y) = (0,0) \end{cases}$ is continuous at every point except the origin.	CO2	(5)
12	a)	Find $\frac{dy}{dx}$ if $y^2 - x^2 - sinxy = 0$	CO2	(2)
	b)	Using Chain rule to find $\frac{dz}{dt}$, $z = 3x^2y^3$, $x = t^4$, $y = t^4$	CO2	(3)
	c)	Find all the second order partial derivative of the function, $f(x,y) = ln\,(x^2 + y^2)$	CO2	(4)
Module 3				
13	a)	Express $\partial w/\partial r$ and $\partial w/\partial s$ in terms of r and s, if w =x^2+ y^2, x = r-s, y =r + s	CO3	(2)
	b)	A bug crawls on the surface z= x^2- y^2 directly above a path in the xy- plane given by x=f(t) and y=g(t). If f(2)=4, $f'(2)$=-1, g(2)= -2 and $g'(2)$=-3, then at what rate is the bug's elevation z changing when t=2?	CO3	(7)
14	a)	Find the derivative of f(x, y) = xe^y+cos(xy) at the point (2, 0) in the direction of v=3i-4j	CO3	(2)
	b)	Find the local extreme values and saddle point of the function f(x, y) = 10xy$e^{-(x^2+y^2)}$	CO3	(7)
Module 4				
15	a)	A furniture manufacture makes two products: chairs and tables with the help of two machines A and B. A Chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours on machine A and 1 hour on machine B. There are 16 hours per day available on machine A and 30 hours on machine B. Profit gained by the manufacturer from a chair and a table is Rs. 2 and Rs.10, respectively. Formulate this problem as a linear programming problem to maximize the total profit of the manufacturer.	CO4	(3)
	b)	Find the extrema values of f(x, y, z)= x^2+2y^2+3z^2 subject to the constraints x + y + z=1 and x-y =0	CO4	(6)
16	a)	For a rectangle whose perimeter is 20 m, use the Lagrange multiplier method to find the dimensions that will maximize the area	CO4	(3)
	b)	A firm manufactures pain relieving pills in two sizes A and B, size A contains 4 grams of element a, 7 grams of element b and 2 grams of element c, size B contains 2 grams of element a, 10 grams of element b and 8 grams of c. It is found by users that it requires at least 12 grams of element a, 74 grams of element b and 24 grams of element c to provide immediate relief. Determine the least no. of pills a patient should take to get immediate relief.	CO4	(6)

MODEL QUESTION PAPER

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST/SECOND SEMESTER B. TECH DEGREE EXAMINATION, MONTH AND YEAR

Course Code: GAPHT121

Course Name: Physics for Information Science

Max. Marks: 60 | Duration: 2 hours 30 minutes

PART A

		Answer all questions. Each question carries 3 marks	CO	Marks
1		Define conduction band and valance band.	1	(3)
2		Evaluate the Fermi function at T greater than 0 and T=0.	1	(3)
3		What do you understand by the wave function Ψ of a moving particle.	2	(3)
4		Starting from the wave equation and introducing energy and momentum of the particle obtain an expression for one dimensional wave function.	2	(3)
5		Compare extrinsic and intrinsic semiconductor.	3	(3)
6		What is the meaning of forward biasing of a p-n junction diode?	3	(3)
7		Mention any six applications of a photo diode.	4	(3)
8		Explain the different types of LED materials along with its radiant colour.	4	(3)

PART B

Answer any one full question from each module. Each question carries 9 marks

Module 1

9	a)	Derive an expression for electrical conductivity of metals.	1	(6)
	b)	What are the postulates of free electron theory?	1	(3)
10	a)	Compare type I and Type 2 superconductors with examples.	1	(6)
	b)	Explain Meissner effect.	1	(3)

Module 2

11	a)	Apply Heisenberg a uncertainty principle to explain nonexistence of electrons inside the nucleus.	2	(6)
	b)	Show that the uncertainty in the location of the particle is equal to de Broglie wavelength when the uncertainty in velocity is equal to its velocity.	2	(3)
12	a)	Obtain Schrödinger's wave equation for a particle in square well potential and discuss energy levels.	2	(9)

Module 3

13	a)	Derive the expressions for concentration of holes in valance band.	3	(9)

14	a)	Obtain the expression for Fermi level in n type semiconductor and hence explain the determination of energy gap.	3	(9)
Module 4				
15	a)	Explain with a neat labelled diagram construction and working of Semiconductor Laser.	4	(9)
16	a)	Explain with a neat sketch the construction, working and V I characteristics of solar cell.	4	(6)
	b)	Explain the working of PIN photodiode.	4	(3)
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MODEL QUESTION PAPER

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B. TECH DEGREE EXAMINATION, MONTH AND YEAR

Course Code: GXCYT122

Course Name: Chemistry for Information Science / Electrical Science

(Common to A & B)

Max. Marks: 60 | Duration: 2 hours 30 minutes

PART A

		Answer all questions. Each question carries 3 marks	CO	Marks
1		What is galvanic series? How is galvanic series advantageous over electrochemical series in corrosion chemistry?	1	(3)
2		Why full charging is not allowed in Li-ion cell?	1	(3)
3		Write any three applications of quantum dots.	2	(3)
4		Define graphene and write any two properties.	2	(3)
5		Explain the role of conjugation in absorption maxima with an example.	3	(3)
6		Write the criteria for a molecule to be IR active.	3	(3)
7		Illustrate break point chlorination	4	(3)
8		What are greenhouse gases?	4	(3)

PART B

Answer any one full question from each module. Each question carries 9 marks

		Module 1		
9	a)	How is electroless copper plating done? Write the reactions involved.	1	(5)
	b)	Explain the determination of pH with a neat diagram.	1	(4)
10	a)	Explain the construction and working of a calomel electrode as a reference electrode.	1	(6)
	b)	What will be the standard electrode potential of Ni^{2+} / Ni electrode if the cell potential of the cell Ni / Ni^{2+}(1M) // Cu^{2+}(0.1M) / Cu is 0.59 V at 25 °C? E^{o} Cu2+/Cu= 0.34	1	(3)
		Module 2		
11	a)	Describe the construction and working of Dye sensitized solar cells.	2	(5)
	b)	Explain the chemical reduction methods used for the synthesis of nanomaterials	2	(4)
12	a)	Describe the construction and working of OLED	2	(5)
	b)	Write a note on fire retardant polymers with examples.	2	(4)
		Module 3		
13	a)	Outline the working and application of DETA.	3	(5)

	b)	Draw the vibrational modes of CO_2 and H_2O and explain their IR active modes.	3	(4)
14	a)	Write the principle behind the SEM analysis. Also give a schematic diagram of SEM instrument.	3	(5)
	b)	Explain the instrumentation and working of UV-vis spectrometer	3	(4)
Module 4				
15	a)	Explain ion exchange process for softening of water?	4	(6)
	b)	List out any three sustainable development goals.	4	(3)
16	a)	Describe UASB process.	4	(5)
	b)	Differentiate between BOD and COD.	4	(4)
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MODEL QUESTION PAPER

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B. TECH DEGREE EXAMINATION, MONTH AND YEAR

Course Code: GMEST103

Course Name: ENGINEERING GRAPHICS AND COMPUTER AIDED DRAWING

(Common to A, B & D)

Max. Marks: 60		Duration: 2 hours 30 minutes

Instructions: Retain Construction lines. Show necessary dimensions. Answer any ONE question from each module. Each question carries 15 marks

MODULE-1			
Sl		**CO**	**MARKS**
1	One end of a line CD is 15 mm above HP and 20 mm in front of VP. At the same time the other end is 60 mm above HP and 50 mm in front of the VP. The distance between the end projectors is 70 mm. Draw the projections of the line and locate the traces. Determine the true and apparent lengths. Also find the true and apparent inclinations.	CO1	15
2	A line CD of length 65 mm is inclined at 45^0 to HP and 30^0 to VP. The end D is 50 mm above HP and 45 mm in front of VP. Draw the projections of the line and locate its traces	CO1	15
MODULE-2			
Sl		**CO**	**MARKS**
3	A cone of base 40 mm diameter and axis 70 mm long has one of its generators on the HP. A plane containing that generator and the axis is perpendicular to HP and inclined at 45 ^{0} to the VP. Draw the projection when the base is nearer to the VP than the vertex.	CO2	15
4	Draw the projections of a triangular pyramid 35 mm side and height 65 mm long, if it is resting on one of the corners of the base in HP with the slant edge containing that base corner making an angle of 30^0 with HP and top view of the axis making an angle of 45^0 with XY- line.	CO2	15
MODULE-3			
Sl		**CO**	**MARKS**
5	A hexagonal pyramid side of the base 30 mm and axis 70 mm rests with its base on the HP and an edge of the base inclined at 30^0 to VP. A section plane inclined at 45^0 to VP and perpendicular to HP passes through the pyramid at a distance of 10 mm from the axis and in front of it. Draw its top view, sectional front view and true shape of section.	CO3	15
6	A pentagonal prism side of base 25 mm and altitude 50 mm, rests on its base on the HP such that an edge of the base is parallel to VP and nearer to the observer. It is cut by a plane inclined at 45° to HP, perpendicular to VP and passing through the centre of the axis. Draw the development of the surface of the truncated prism.	CO3	15
MODULE-4			
Sl		**CO**	**MARKS**
7	Draw the isometric view of a pentagonal pyramid, side of base 20 mm and height 50 mm which rests centrally with base on a cylinder of diameter 60 mm and height 40 mm.	CO4	15
8	A cone of diameter 50 mm base and height 60 mm is surmounted over a square slab of 60 mm side and 20 mm thickness on HP so that one of the edges of the square slab is parallel to VP. Draw the isometric projection of the combination.	CO4	15

MODEL QUESTION PAPER

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B. TECH DEGREE EXAMINATION, MONTH AND YEAR

Course Code: GXEST104

Course Name: INTRODUCTION TO ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to A & B)

Max. Marks: 60		Duration: 2 Hours 30 Minutes

PART A

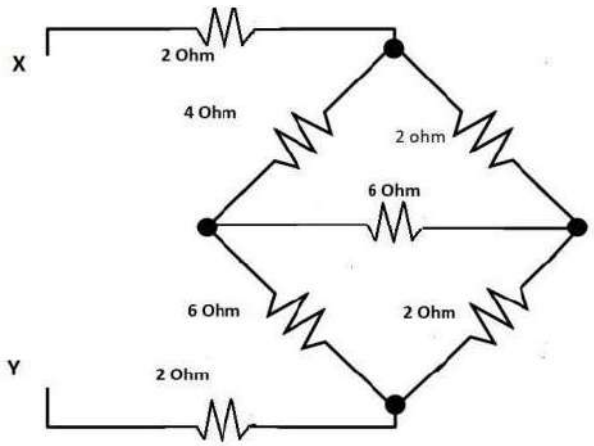
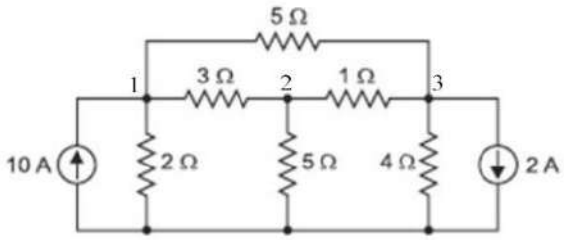
		Answer all questions. Each question carries 3 marks	CO	Marks
1		Derive the expression for energy stored in the inductor.	1	(3)
2		Define the following terms: (a) magnetic flux density (b) reluctance (c) magnetic field intensity (d) permeability.	2	(3)
3		Explain the phasor diagram and impedance triangle of a series resistive inductive circuit excited by an AC source	2	(3)
4		Derive an relation between line and phase voltages in a three phase star connected system	3	(3)
5		Explain different resistor colour coding schemes	4	(3)
6		Why does voltage gain of an RC coupled amplifier decrease at low and high frequencies?	4	(3)
7		Compare amplitude and frequency modulation.	5	(3)
8		With necessary block diagram, explain an electronic instrumentation system.	5	(3)

PART B

Answer any one full question from each module. Each question carries 9 marks

Module 1

9	a)	Find the equivalent resistance between X-Y terminals in the figure	1	(9)

				
10	a)	Using nodal analysis, determine the voltage across various resistors. 	1	(9)
		Module 2		
11	a)	An alternating voltage is v = 100sin100t. Find (i) amplitude (ii) frequency (iii)Time period (iv) angular velocity (v) form factor.	2	(5)
	b)	Differentiate between statically induced emf and dynamically induced emf.	2	(4)
12	a)	Three impedances each having resistance 20Ω and an inductive reactance of 15Ω are connected in star across a 400V, 3 phase, AC supply. Calculate (a) the line current (b) power factor (c) total power. If the load is connected in delta, determine the total power consumed by the load.	3	(9)
		Module 3		
13	a)	Draw the block diagram of DC power supply and explain the function of each block.	4	(5)
	b)	Draw and explain the input and output characteristics of a transistor in common emitter configuration.	4	(4)
14	a)	Draw the circuit diagram of a simple zener voltage regulator and explain its working. Define the terms line regulation and load regulation.	4	(5)
	b)	Give the circuit diagram of an RC coupled amplifier. Explain its working.	4	(4)
		Module 4		

15	a)	Draw the block diagram of a GSM system and explain its working principle.	5	(9)
16	a)	Draw and Explain the Block diagram of Fiber optic Communication system.	5	(5)
	b)	Draw the block diagram of Digital Multimeter. Explain its working.	5	(4)
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MODEL QUESTION PAPER

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B. TECH DEGREE EXAMINATION, DECEMBER 2024

Course Code: UCEST105

Course Name: Algorithmic Thinking with Python

Max. Marks: 60 | Duration: 2 hours 30 minutes

PART A

		Answer all questions. Each question carries 3 marks	CO	Marks
1		How do you use a decomposition strategy to design a menu-driven calculator that supports four basic arithmetic operators - addition, subtraction, multiplication, and division?	1	(3)
2		A mad scientist wishes to make a chain out of plutonium and lead pieces. There is a problem, however. If the scientist places two pieces of plutonium next to each other, BOOM! The question is, in how many ways can the scientist safely construct a chain of length ***n***?	4	(3)
3		Write a **case** statement that will examine the value of ***flag*** and print one of the following messages, based on its value. **Flag value** | **Message** 1 | Hot 2 | Luke warm 3 | Cold Any other value | Out of range	3	(3)
4		Draw a flowchart to print the numbers that are divisible by 4 but not by 3 in a list of ***n*** positive numbers.	3	(3)
5		Identify and rectify the problem with the following recursive definition to find the greatest common divisor of two positive integers. **ABC (n , m)** if **n == 2** return **m** else return **ABC(m , n mod m)**	4	(3)
6		Write a recursive procedure to search for a ***key*** in a list of ***n*** integers.	4	(3)
7		Compare and contrast greedy and dynamic programming strategies.	3	(3)

8		Give the pseudocode for brute force technique to find the mode of elements in an array. Mode is the value that appears most frequently in the array.	3	(3)
PART B				
Answer any one full question from each module. Each question carries 9 marks				
Module 1				
9		Walk through the six problem-solving steps to find the largest number out of three numbers.	1	(9)
10	a)	Your professor has given you an assignment on "Algorithmic thinking" to be submitted by this Wednesday. How do you employ means-end analysis to devise a strategy for completing your assignment before the deadline?	2	(5)
	b)	Name two current problems in your life that might be solved through a heuristic approach. Explain why each of these problems can be solved using heuristics.	1	(4)
Module 2				
11	a)	Mr. Shyam, a history professor, would like to know the percentage increase in the population of our country per decade given the first decade and the last decade. Other given data include the population at the beginning of each decade. Draw a flowchart for determining the percentage increase in the population.	3	(6)
	b)	Draw a flowchart to find the average mileage of a car in kilometers per litre after six fill-ups at petrol pumps. Input data include the number of litres of diesel, the starting odometer reading, and the odometer reading at each fillup.	3	(3)
12	a)	A standard science experiment is to drop a ball and see how high it bounces. Once the "bounciness" of the ball has been determined, the ratio gives a bounciness index. For example, if a ball dropped from a height of 10 feet bounces 6 feet high, the index is 0.6, and the total distance traveled by the ball is 16 feet after one bounce. If the ball were to continue bouncing, the distance after two bounces would be 10 ft + 6 ft + 6 ft + 3.6 ft = 25.6 ft. Note that the distance traveled for each successive bounce is the distance to the floor plus 0.6 of that distance as the ball comes back up. Write an algorithm that lets the user enter the initial height of the ball, bounciness index and the number of times the ball is allowed to continue bouncing. Output should be the total distance traveled by the ball.	3	(6)

<table>
<tr><td></td><td>b)</td><td>Light travels at 3×10^8 meters per second. A light-year is the distance a light beam travels in one year. Write an algorithm that inputs a large distance value (in meters) and displays it in light-years.</td><td>3</td><td>(3)</td></tr>
<tr><td colspan="5">Module 3</td></tr>
<tr><td rowspan="2">13</td><td>a)</td><td>Write a recursive function to find an array's minimum and maximum elements. Your method should return a tuple (a, b), where a is the minimum element and b is the maximum.</td><td>4</td><td>(5)</td></tr>
<tr><td>b)</td><td>Write a program to input a matrix and determine its type: lower triangular, upper triangular, or diagonal.</td><td>4</td><td>(4)</td></tr>
<tr><td rowspan="2">14</td><td>a)</td><td>Write a program to read N words and display them in the increasing order of their lengths. The length of each word is also to be displayed.</td><td>4</td><td>(6)</td></tr>
<tr><td>b)</td><td>There are 500 light bulbs (numbered 1 to 500) arranged in a row. Initially, they are all OFF. Starting with bulb 2, all even numbered bulbs are turned ON. Next, starting with bulb 3, and visiting every third bulb, it is turned ON if it is OFF, and it is turned OFF if it is ON. This procedure is repeated for every fourth bulb, then every fifth bulb, and so on up to the 500th bulb. Devise an algorithm to determine which bulbs glow at the end of the above exercise.</td><td>4</td><td>(3)</td></tr>
<tr><td colspan="5">Module 4</td></tr>
<tr><td>15</td><td>a)</td><td>Studies show that the capacity of an empty human stomach is 1.5 litres on average. Give a greedy algorithm to output an efficient lunch menu maximizing the total nutritional value. The available items along with their nutritional values are tabulated below:
<table>
<tr><th>Recipe</th><th>Available quantity</th><th>Nutritional value</th></tr>
<tr><td>Cooked rice</td><td>2.5 cups</td><td>800 calories</td></tr>
<tr><td>Sambar</td><td>1.5 cups</td><td>140 calories</td></tr>
<tr><td>Potato curry</td><td>0.5 cup</td><td>50 calories</td></tr>
</table></td><td>3</td><td>(6)</td></tr>
</table>

		<table><tr><td>Fish fry</td><td>0.5 cup</td><td>200 calories</td></tr><tr><td>Buttermilk</td><td>1 cup</td><td>98 calories</td></tr><tr><td>Payasam</td><td>2 cups</td><td>300 calories</td></tr></table> You may assume that 1 cup is equivalent to 250ml.		
	b)	How are recursion and dynamic programming (DP) related? Is it possible to construct a DP version for all recursive solutions?	2	(3)
16	a)	Write a Python program for a random walk simulation in a 2D grid starting from the origin **(0, 0)**. At each step, randomly move up, down, left, or right. Print the final position after 10 steps.	3	(4)
	b)	Use divide and conquer to find the majority element in an array, where the majority element appears more than n/2 times. Divide the array into two halves, find the majority element in each half, and combine the results to identify if there is a majority element in the entire array.	2	(5)
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