

UOM Exam Second half 2021_Question paper_R2019/CSC302 - Discrete Structures & Graph Theory /Sem-III / COMPUTER ENGINEERING

Dear Student,

Please note before you attempt this section of examination:

1. Q1, Q2, Q3 and Q4 carry 20 marks each.
2. This paper contains 20 Marks MCQ and 60 marks subjective section for 150 minutes duration.
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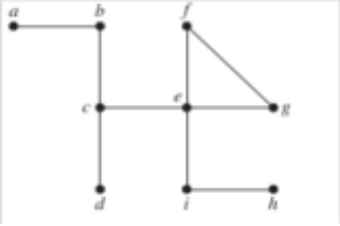
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Solve Questions as per the
instructions given separately.

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- For MCQs Question write Question number & correct option with complete text in option.
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1.	Let a set $S = \{2, 3, 4, 6, 9, 12, 18, 24, 54\}$ and R be the partial order relation of divisibility. Number of edges in its hasse diagram are _____
Option A:	10
Option B:	12
Option C:	14
Option D:	8
2.	The number of elements in the power set of $A = \{e, f, g, h\}$ is
Option A:	9
Option B:	8
Option C:	16
Option D:	12
3.	Which of the following Poset is a Distributed Lattice?
Option A:	D_{50}
Option B:	D_{105}
Option C:	D_{20}
Option D:	D_{75}
4.	Let f and g be the functions from the set of integers to itself, defined by $f(x) = 3x + 1$ and $g(x) = 4x + 4$. Then the composition of f and g is _____
Option A:	$12x+4$
Option B:	$12x+5$
Option C:	$12x + 13$
Option D:	$12x+8$
5.	How many strings of length 8 either begin with 2 zeros or end with 4 ones?
Option A:	80
Option B:	42
Option C:	76
Option D:	64

6.	If every vertex of simple graph has same degree then it is called as _____.
Option A:	Bipartite Graph
Option B:	Regular Graph
Option C:	Planner Graph
Option D:	Sub graph
7.	What is the identity element in the group $G = \{1, 2, 3, 4, 5, 6, 7, 8\}$ under multiplication modulo 9?
Option A:	1
Option B:	5
Option C:	4
Option D:	9
8.	Total how many Cut Vertices exist in the following graph? 
Option A:	2
Option B:	4
Option C:	3
Option D:	1
9.	A planer graph with 10 edges & 5 vertices has _____ regions.
Option A:	5
Option B:	7
Option C:	15
Option D:	13
10.	Consider the following subsets of the positive integers N . Which of the following is not closed under multiplication operation?
Option A:	$A = \{0, 1\}$
Option B:	$E = \{1, 3, 5, \dots\}$
Option C:	$C = \{x: x \text{ is prime}\}$
Option D:	$F = \{0, 1, 2\}$

Q2 (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Prove using Mathematical Induction that $7^{2n} + 2^{3n-3} * 3^{n-1}$ is divisible by 25 for all $n \in \mathbb{N}$
ii.	What is a lattice? Draw the hasse diagram of D_{66} . Whether it is a distributive lattice? Justify your answer.
iii.	What are the isomorphic graphs? Determine whether following graphs G & H are isomorphic. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>G</p> </div> <div style="text-align: center;"> <p>H</p> </div> </div>
B	Solve any One 10 marks each
i.	Define the transitive property of a relation. Find the transitive closure of R using Warshall's algorithm where $A = \{1, 2, 3, 4, 5, 6\}$ & $R = \{(1, 2), (2, 3), (3, 5), (5, 6), (5, 2)\}$
ii.	Describe the following terms with suitable example- a) Disjunctive Normal Form (DNF) b) partition set c) Complement of a relation d) Ring e) Bipartite graphs

Q3 (20 Marks Each)	
A	Solve any Two 5 marks each
i.	Define the equivalence relation. Let R be the relation on Z which is defined as xRy if $3x+5y$ is divisible by 8. Determine whether this is an equivalence relation.
ii.	What is a linearly ordered set? Draw the hasse diagram of D_{625} . Determine whether it is the linearly ordered set or not.
iii.	Let $A = \{1, 2, 3, 4, 6, 9\}$ and let R be the relation on A defined by "x divides y" written x/y . a) Write R as a set of ordered pairs. b) Draw its directed graph. c) Find indegree & outdegree of each vertex. d) Write the relation matrix of it. e) Find the inverse relation of R.
B	Solve any One 10 marks each
i.	a) Show that if 6 colors are used to paint 37 bicycles, then 7 of them must have same color. b) There are 6 Mathematics books, 8 Discrete Structures books, 9 Data Structures books. How many ways can be used by the student so that 2 books from different categories can be chosen?
ii.	Define minimum hamming distance. Find the code words generated by the parity check matrix H given below. $H = \begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Q4 (20 Marks Each)	
A	Solve any Two 5 marks each
i.	How many integers between 1 & 250 are divisible by 3, 5 or 7?
ii.	$f: \mathbb{R} \rightarrow \mathbb{R}$ is defined as $f(x) = x^3$ $g: \mathbb{R} \rightarrow \mathbb{R}$ is defined as $f(x) = 4x^2 + 1$ $h: \mathbb{R} \rightarrow \mathbb{R}$ is defined as $h(x) = 7x - 1$ find the rule of defining (hog)of, go(hof).
iii.	What is an adjacency matrix & incidence matrix? Give the suitable examples of both.
B	Solve any One 10 marks each
i.	a) Define the term bijective function. Let $f: \mathbb{R} \rightarrow (7/5) \rightarrow \mathbb{R} - \left(\frac{2}{5}\right)$ be defined by $f(x) = \frac{2x - 3}{5x - 7}$. Prove that it is a bijection. Hence find f^{-1} .
ii.	What is a group? Let $S = \{0, 3, 6, 9, 12\}$ Prepare the composition table w.r.t. the operation of addition modulo 15. Show that it is an abelian group. Find the inverses of all the elements. Whether it is a cyclic group?

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UOM Exam Second half 2021_Question paper_R2019/CSC305 - Computer Graphics /Sem-III / COMPUTER ENGINEERING

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- For MCQs Question write Question number & correct option with complete text in option.
- Q2 to Q4 are subjective questions - Solve Questions as per the instructions and marks allotted.

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which of the following statement does not define computer graphics
Option A:	The technology that deals with designs and pictures on computers.
Option B:	Visual images or designs on some surface such as wall, paper to inform, illustrate or entertain.
Option C:	Almost everything on computer that is not text or sound.
Option D:	It is an art of drawing pictures on a computer screen with the help of programming.
2.	In DDA line drawing method, for lines having negative slope with absolute value greater than 1 and taking right end point as starting point, the X and Y coordinate increments are
Option A:	1/m and -1
Option B:	-1/m and 1
Option C:	-1 and -m
Option D:	1 and m
3.	In Homogenous Coordinate System, all Transformations are captured by
Option A:	Addition
Option B:	Subtraction
Option C:	Multiplication
Option D:	Division
4.	Coordinates of clipping window : Lower Left Corner (10,10) and Upper Right Corner (50,50).What is the region code of point (7,60)?
Option A:	1001
Option B:	1010
Option C:	0110
Option D:	0101

5.	In depth buffer method, depth of (x,y) is set to z only when
Option A:	$\text{Depth}(x,y) < z$
Option B:	$\text{Depth}(x,y) \leq z$
Option C:	$\text{Depth}(x,y) > z$
Option D:	$\text{Depth}(x,y) \geq z$
6.	A cube is defined by 8 vertices A(0,0,0), B(2,0,0), C(2,2,0), D(0,2,0), E(0,0,2), F(2,0,2), G(2,2,2), H(0,2,2) After translation by $t_x=1$, $t_y=2$, $t_z=1$ resultant position is,
Option A:	A(1,2,1), B(3,2,1), C(3,4,1), D(1,4,1), E(1,2,3), F(3,2,3), G(3,4,3), H(1,4,3)
Option B:	A(1,2,1), B(1,2,3), C(3,4,1), D(1,1,1), E(1,2,3), F(1,4,3), G(3,2,3), H(3,3,3)
Option C:	A(1,2,1), B(3,2,1), C(1,4,3), D(1,4,1), E(3,2,1), F(1,4,3), G(2,2,3), H(3,3,4)
Option D:	A(1,1,1), B(3,2,1), C(1,2,3), D(1,4,1), E(3,2,1), F(1,4,3), G(2,2,2), H(3,3,4)
7.	(5,10) is a point on an ellipse that has a center at the origin (0,0). Which of the following point is also on the same ellipse
Option A:	(0, 10)
Option B:	(10, 5)
Option C:	(-10, -5)
Option D:	(-5, -10)
8.	What happens when in 3D space uniform scaling with respect to origin is performed, I) Original shape of object may change II) Original position of object may change
Option A:	Only I
Option B:	Only II
Option C:	Both I and II
Option D:	Neither I nor II

9.	In mid point ellipse method, if (X_i, Y_i) is plotted in region 2, then for next point, the ellipse function is evaluated at
Option A:	$(X_i + \frac{1}{2}, Y_i - 1)$
Option B:	$(X_i - \frac{1}{2}, Y_i + 1)$
Option C:	$(X_i - 1, Y_i + \frac{1}{2})$
Option D:	$(X_i + 1, Y_i - \frac{1}{2})$
10.	Liang Barsky Line Clipping method uses _____ equations for clipping.
Option A:	Linear
Option B:	Quadratic
Option C:	Slope Intercept form
Option D:	Parametric

+

Q2 (20 marks)	
	Solve any Four 5 marks each
i.	What is an Animation? What are the different principles of animation?
ii.	What is aliasing effect? Explain antialiasing techniques.
iii.	Explain homogeneous coordinates system and its use in geometric transformations.
iv.	Explain the following terms a. Scan conversion b. Window and viewport
v.	Write a short note on key framing
vi.	Prove that 2D rotation and scaling commute if $S_x = S_y$ and $\theta = n\pi$

Q3 (20 marks)	
	Solve any Two 10 marks each
i.	Calculate the pixel positions along a straight line between $P_1(20,20)$ and $P_2(10,12)$ using Bresenham's line drawing method.
ii.	Derive the matrix for 3D rotation of an object about an arbitrary rotation axis.
iii.	What is visible surface detection? Explain depth buffer method with suitable diagrams.

Q4 (20 marks)	
	Solve any Two 10 marks each
i.	Derive the equations for mid-point ellipse drawing algorithm with suitable diagrams.
ii.	Given an object with coordinate points A (10, 0), B (20, 0), C (20, 10), D(10, 10). Scale the polygon by 0.5 units in x direction and 2 units in y direction. Find new coordinates of an object.
iii.	Explain Cohen Sutherland line clipping method with suitable example

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UOM Exam Second half 2021_Question paper_R2019/CSC303 - Data Structure /Sem-III / COMPUTER ENGINEERING

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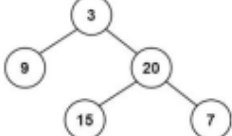
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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Balanced factor of root node after inserting the element 19 in the given AVL tree will become - 
Option A:	-1
Option B:	1
Option C:	2
Option D:	-2
2.	Which of the following condition can hold true, if a circular queue implemented using an array of size MAX, overflows ?
Option A:	front=rear+1
Option B:	rear=front
Option C:	front=(rear+1)%MAX
Option D:	rear=MAX-1
3.	Which among the following is not a linear data structure?
Option A:	Two Dimensional Array
Option B:	Double Ended Queue
Option C:	Binary Search Tree
Option D:	Doubly Linked List
4.	Consider a stack containing following elements 9 3 7 2 << top, where the top element is 2. You need to get the following stack 9 3 5 7 << top. The operations that needed to be performed are (You can perform only push and pop):
Option A:	pop(), push(5)
Option B:	pop(), pop(), push(5), push(7)
Option C:	pop(), pop(), push(5), pop(), push(7)
Option D:	push(5), push(7)

5.	Which of the following is not a collision resolution method?
Option A:	Separate chaining
Option B:	Linear search
Option C:	Linear probing
Option D:	Double hashing
6.	The post order traversal for the below given binary search tree, after deleting the nodes 6 and 13 is -
Option A:	1,3,4,7,8,10,14
Option B:	1,4,7,3,8,10,14
Option C:	1,4,7,3,10,14,8
Option D:	1,4,7,3,14,10,8
7.	Which type of linked list begins with a pointer to the first node and each node contains a pointer to the next node, and the pointer in the last node points back to the first node?
Option A:	Singly linked list
Option B:	Doubly linked list
Option C:	Circular singly linked list
Option D:	Circular doubly linked list

8.	After inserting the elements 60, 30, 14, 78, 72, 89 in sequence in a B-tree of order-3, what will be the root node?
Option A:	60,72
Option B:	30,78
Option C:	60,78
Option D:	30,72
9.	The Data structure used in the standard implementation of Breadth First Search is?
Option A:	Tree
Option B:	Linked List
Option C:	Queue
Option D:	Stack
10.	What will be the topological ordering for the below graph.
Option A:	A B C D E F
Option B:	A B E F C D
Option C:	A B E C F D
Option D:	A B C D F E

Q2	Solve any Four out of Six	5 marks each
A	What is a non-linear data structure? Explain with example.	
B	Explain Queue ADT.	
C	Write a function to find and display the sum and average of elements in a singly linked list.	
D	Explain different cases of deletion of a node in binary search tree with an example.	
E	Explain in brief Double Ended Queue.	
F	Consider a hash table of size 11 that uses quadratic probing to resolve collisions. Insert the keys : 12,19,23,30,34,45,59,61 in sequence in the hash table. Draw the table after inserting in the given order and also find the total number of collisions.	

Q3	Solve any Two Questions out of Three	10 marks each
A	Write a program in C to check for balanced parentheses using stack. Simulate with an example.	
B	Write the function for BFS traversal of a graph ADT. Show with a directed graph the BFS traversal.	
C	Create AVL tree by inserting the given values in sequence: 45,8, 33, 85, 61, 10, 48, 76, 57,99	

Q4	Solve any Two Questions out of Three	10 marks each
A	Write a program to create a singly linked list containing following functions: a) Insert at end b) Display c) Count odd and even elements in the list.	
B	Create B tree of order 3 by inserting the given values in sequence: 56, 9, 567, 66, 234, 89, 12, 45, 789, 74.	
C	Write a program to implement circular queue using linked list.	

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UOM Exam Second half 2021_Question paper_R2019/CSC304 - Digital Logic & Computer Architecture /Sem-III / COMPUTER ENGINEERING

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	What is does the Program Counter Holds
Option A:	It Holds the Address of the Current Instruction
Option B:	It Holds the Address of the Next Instruction
Option C:	It Holds the Current Instruction
Option D:	It Holds the Next Instruction
2.	Arrange the steps for obtaining IEEE representation of floating point in proper format 1) calculate the biased exponent 2) convert to binary 3) convert to normalized form
Option A:	1,2,3
Option B:	3,2,1
Option C:	2,3,1
Option D:	2,1,3
3.	In Booths Algorithm in one of the step $M=0010$ $A=0010$ $Q=0100$ $Q_{-1}=0$ and count is not zero what it will be the value of M A Q and Q_{-1} in the immediate next step
Option A:	$M=0010$ $A=0001$ $Q=0100$ $Q_{-1}=0$
Option B:	$M=0010$ $A=0001$ $Q=0010$ $Q_{-1}=0$
Option C:	$M=0010$ $A=0001$ $Q=0010$ $Q_{-1}=1$
Option D:	$M=0010$ $A=0001$ $Q=0000$ $Q_{-1}=0$
4.	Identify the type of addressing mode for the diagram shown below 
Option A:	Register Addressing mode
Option B:	Register Direct Addressing Mode
Option C:	Immediate Addressing Mode
Option D:	Register Indirect Addressing Mode

5.	Which of the following is not a key characteristics of memory devices or memory system
Option A:	Location
Option B:	Physical Characteristics
Option C:	Availability
Option D:	Access Method
6.	The correspondence between the main memory blocks and those in the cache is given by _____.
Option A:	Mapping function
Option B:	Hash function
Option C:	Locale function
Option D:	Assign function
7.	Basic task for control unit is
Option A:	to perform logical operations
Option B:	to perform execution
Option C:	to initiate the resources
Option D:	to decode instructions and generate control signal
8.	Micro program consisting of _____ is stored in control memory of control unit
Option A:	Instructions
Option B:	micro instructions
Option C:	micro program
Option D:	macro program
9.	Flynn's taxonomy classifies computer architectures based on
Option A:	the number of instructions that can be executed
Option B:	how they operate on data.
Option C:	the number of instructions that can be executed and how they operate on data.
Option D:	The number of Control Signals Generated
10.	Which of the following is not a valid type of centralized bus arbitration
Option A:	Dependent Request
Option B:	Daisy chaining
Option C:	Polling method
Option D:	Independent Request

Q2	Solve any Four out of Six	5 marks each
A	Describe the detailed Von-Neumann Model.	
B	Convert 12.5 in IEEE 754 Single Precision Format.	
C	Write a Short note on Flip Flops.	
D	Differentiate between Hardwired control unit and Micro programmed control unit.	
E	Describe the Difference between SRAM & DRAM.	
F	Write short notes on PCI Bus.	

Q3	Solve any Four out of Six	5 marks each
A	Explain any five Addressing Modes.	
B	Explain State Table design method for Hardwired control unit.	
C	List the Characteristics of Memory.	
D	What is Instruction Pipelining? Define the Pipeline performance Measures like SpeedUp, Efficiency, CPI, Throughput.	
E	Draw the neat block diagram for Flynn's Classification (Only the Diagram).	
F	Explain the Bus Arbitration.	

Q4.	Solve any Two Questions out of Three	10 marks each
A	Draw the flowchart of Booth's Algorithm & perform 6×-3 using this Algorithm	
B	Describe the Micro programmed Control unit. Write micro program for the instruction ADD A, B (Register A and B are added and result is stored at Register A.).	
C	Explain any two Cache memory Mapping Techniques.	

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UOM Exam Second half 2021_Question paper_R2019/CSC 301 - Engineering Mathematics III /Sem-III / COMPUTER ENGINEERING

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Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	The Laplace transform of $\int_0^t \frac{1-e^{au}}{u} du$ is
Option A:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
Option B:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
Option C:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
Option D:	$\frac{1}{s} \log\left(\frac{s-a}{s}\right)$
2	If $f(x) = \sqrt{(1 - \cos x)}$, $0 < x < 2\pi$ then find a_0 .
Option A:	$\frac{2\sqrt{2}}{\pi}$
Option B:	$\frac{\sqrt{2}}{\pi}$
Option C:	$\frac{\sqrt{2}}{3\pi}$
Option D:	$\frac{1}{\pi}$

3.	If $f(z) = u + iv$ is analytic then
Option A:	u is harmonic but v may or may not be harmonic.
Option B:	v is harmonic but u may or may not be harmonic.
Option C:	u and v both need not be harmonic.
Option D:	u and v both harmonic.
4.	If $\text{Var}(X) = 4$ then $\text{Var}(3x+5)$ is
Option A:	12
Option B:	20
Option C:	26
Option D:	36
5.	If $f(x)$ is an even function in the interval $(-l, l)$ then in the Fourier series expansion of $f(x)$
Option A:	$a_n = 0, b_n = 0.$
Option B:	$a_n = 0, a_0 = 0.$
Option C:	$b_n = 0.$
Option D:	$a_0 = 0, b_n = 0.$
6	If $b_{yx} = 0.7764, b_{xy} = 1.2321$ then coefficient of correlation
Option A:	0.9781
Option B:	0.6291
Option C:	1.2307
Option D:	0.0023

7	Find the constants a, b, c, d if $f(z) = x^2 + 2axy + 2by^2 + i(2cx^2 + dxy + y^2)$
Option A:	$a = 1, b = -\frac{1}{2}, c = -\frac{1}{2}, d = 2.$
Option B:	$a = 0, b = -\frac{1}{2}, c = -\frac{1}{2}, d = 2.$
Option C:	$a = 1, b = -2, c = -\frac{1}{2}, d = 1.$
Option D:	$a = 3, b = -\frac{1}{2}, c = -\frac{1}{2}, d = 2.$
8	If X_1 has mean 4 and variance 9 and If X_2 has mean -2 and variance 4 and they are independent then $Var(2X_1 + X_2 - 3)$ is
Option A:	41
Option B:	40
Option C:	36
Option D:	37
9	Suppose two fair dice are thrown and sum of the numbers on dice is noted, what is the probability that the sum can be equal to 6, 7, 8 or 9.
Option A:	2/9
Option B:	5/9
Option C:	4/9
Option D:	7/9
10.	Let X denotes the demand in quintals and Y denotes the price in rupees per kg. Also if $\bar{X} = 68, \bar{Y} = 69, \sum(X - \bar{X})^2 = 36, \sum(Y - \bar{Y})^2 = 44, \sum(X - \bar{X})(Y - \bar{Y}) = 24$ then the Karl Pearson's coefficient (r) of correlation is
Option A:	0.4030
Option B:	0.5030
Option C:	0.7030
Option D:	0.6030

Q2	Solve any Four out of Six 5 marks each
A	If $L\{\sin\sqrt{t}\} = \frac{\sqrt{\pi}}{2s\sqrt{s}} e^{-1/(4s)}$, find $L\{\sin 2\sqrt{t}\}$
B	Find the inverse Laplace transform of $\frac{s+29}{(s+4)(s^2+9)}$
C	Find the Fourier series for $f(x)$ in $(0, 2\pi)$ where $f(x) = \begin{cases} x, & 0 < x \leq \pi \\ 2\pi - x, & \pi \leq x < 2\pi \end{cases}$
D	If $v = 3x^2y + 6xy - y^3$, show that v is harmonic function and find the corresponding analytic function.
E	Calculate the value of rank correlation coefficient from the following data regarding marks of 6 students in Statistics and Mathematics in a test: Marks : Statistics : 40, 42, 45, 35, 36, 39 Marks : Mathematics : 46, 43, 44, 39, 40, 43
F	Three factories A, B, C produces 30%, 50% and 20% of the total production of an item. Out of their production 80%, 50% and 10% are defective. An item is chosen at random and found to be defective. Find the probability that it was produced by the factory A .

Q3	Solve any Four out of Six 5 marks each
A	By using Laplace transform, prove that $\int_0^{\infty} e^{-t} \frac{\sin^2 t}{t} dt = \frac{1}{4} \log 5$
B	Using convolution theorem, find the inverse Laplace transform of $\frac{1}{(s-2)^4 (s+3)}$
C	Obtain Fourier series for $f(x) = x + x^2, -1 < x < 1$
D	Find an analytic function $f(z) = u + iv$, where $u + v = e^x (\cos y + \sin y)$
E	State true or false with justification. "If two lines of regression are $x + 3y - 5 = 0$ and $4x + 3y - 8 = 0$, then the correlation coefficient is +0.5".
F	If the mean of the following distribution is 16. Find m, n and variance. X : 8, 12, 16, 20, 24 $P(X)$: $\frac{1}{8}$ m n $\frac{1}{4}$ $\frac{1}{12}$

Q4	Solve any Four out of Six	5 marks each
A	Find the Laplace transform of $e^{-tz} \int_0^z u \sin 3u du$	
B	Find the inverse Laplace transform of $\tan^{-1}\left(\frac{a}{s}\right)$	
C	Obtain half- range sine series for $f(x)$ where $f(x) = \begin{cases} x, & 0 < x < (\pi/2) \\ \pi - x, & (\pi/2) < x < \pi \end{cases}$	
D	Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$	
E	Fit a straight line to the following data. $(x,y) = (-1,-5), (1,1), (2,4), (3,7), (4,10)$ Estimate y when $x = 7$	
F	A random variable X has the following probability density function $f(x) = \begin{cases} ke^{-kx}, & x > 0, k > 0 \\ 0, & elsewhere \end{cases}$ Find the moment generating function and hence, the mean and variance.	

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