UOM Exam Second half 2021_Question paper_R2019/CSC305 - Computer Graphics /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.
3. It is mandatory for all the students to upload their answer papers in a single PDF format only.
4. You have to write Date of Examination, Seat number, Program, Scheme and semester, Subject name, Signature on EVERY PAGE.
5. Remain in the meet with your camera on and you in clear view throughout the duration of the exam.

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Solve Questions as per the instructions given separately.

- Please upload a single PDF for Q1 to Q4
- 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.	Unequal brightness is the example of
Option A:	Antialiasing
Option B:	High Resolution
Option C:	Polygon Rendering
Option D:	Aliasing
2	Bresenham's line drawing algorithm uses
Option A:	Real and integer arithmetic
Option B:	Floating point arithmetic only
Option C:	Real arithmetic only
Option D:	Integer Arithmetic only
3.	The Pixel (Xw, Yw, w) represents
Option A:	Wrong representation of pixel
Option B:	3- Dimensional coordinate system
Option C:	Normalized device coordinate system
Option D:	Homogeneous Coordinate System
4.	The process of changing position of an object along the circular path is called as
Option A:	Translation
Option B:	Rotation
Option C:	Shearing
Option D:	Reflection
5.	When the 2D point (x, y) is reflected about an origin then new coordinates of the point are given by
Option A:	(-x, -y)
Option B:	(x, -y)
Option C:	(y, x)
Option D:	(-x, y)

6.	In Cohen Sutherland line clipping algorithm, if both the endpoints of line segment lie inside the window boundary then region code of both the end points are
Option A:	0001
Option B:	0000
Option C:	1000
Option D:	0010
7.	What are the final coordinates of the point P (5,5,5) after anticlockwise rotation by an angle 90 about the Z-axis?
Option A:	(5, -5, -5)
Option B:	(-5, -5, -5)
Option C:	(-5, 5, 5)
Option D:	(5, 5, 5)
8.	The equation of the Bezier curve is given as $P(u) = (1-u)^3 . P_1 + 3.u.(1-u)^2 . P_2 + 3.u^2 .(1-u). P_3 + u^3 P_4$, where the value of 'u' is in between
Option A:	$-1 <= u <= 1$
Option B:	$0 <= u <= 1$
Option C:	$1 <= u <= 100$
Option D:	$100 <= u <= 200$
9.	----------is used to detect the visible surfaces and remove hidden surfaces
Option A:	Boundary Fill algorithm
Option B:	Liang Barsky algorithm
Option C:	Bresenham's algorithm
Option D:	Area Subdivision method
10.	----------is used for recording actions of actors for animations or visual effects.
Option A:	Deformation
Option B:	Motion Capture
Option C:	Rotation
Option D:	Reflection

Q2. (20 Marks Each	
A	**Solve any Two** **5 marks each**
i.	Plot a circle using midpoint circle drawing algorithm with radius 4 units and centered at origin
ii.	Given a triangle with coordinate points A (4, 5), B (7, 5), C (6, 7). Apply the reflection with respect to X axis and obtain the new coordinates of the object.
iii.	Define the following terms with example a) Rasterization and Rendering b) Scan Conversion
B	**Solve any One** **10 mark each**
i.	Derive 3 – D composite transformation matrix for rotating an object about an arbitrary axis.
ii.	What is B-spline curve? What are advantages of B-spline curve over Bezier curve? Explain it with example.

Q3. (20 Marks Each)	
A	**Solve any Two** **5 marks each**
i.	Derive the 2-D composite transformation matrix to rotate an object about an arbitrary point in clockwise direction.
ii.	What is back surface detection? Explain Z Buffer algorithm with example
iii.	What is an Animation? What are the different principles of animation?
B	**Solve any One** **10 mark each**
i.	What are the drawbacks of Sutherland polygon fill algorithm? How that are overcome by Weiler Atherton polygon clipping algorithm, Explain it with example.
ii.	Explain scan line polygon fill algorithm with suitable example

Q4. (20 Marks Each)	
A	**Solve any Two** **5 marks each**
i	What is normalization transformation? Explain it with example
ii	What are drawbacks of the boundary fill algorithm? How can that be overcome by the Flood Fill algorithm? Write flood fill algorithm using 8 connected approach.
iii	What is Parallel Projection? Derive the homogeneous transformation matrix for parallel projection
B	**Solve any One** **10 mark each**
i	Derive and explain mid-point ellipse drawing algorithm
ii	Clip the line segment using Liang Barsky line clipping algorithm. The Coordinates of window boundaries are (Xwmin, Ywmin) = (4, 4) and (Xwmax, Ywmax) = (10, 9), and coordinates of two endpoints of line segment are P1(x1, y1) = (2, 5) and P2(x2, y2) = (8, 11)

6. Please Upload complete scanned answer copy in a single PDF file. *

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7. Have you uploaded correct scanned copy of the answer sheets. *

   Mark only one oval.

   ◯ YES

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

Dear Student,
Please note before you attempt this section of examination:
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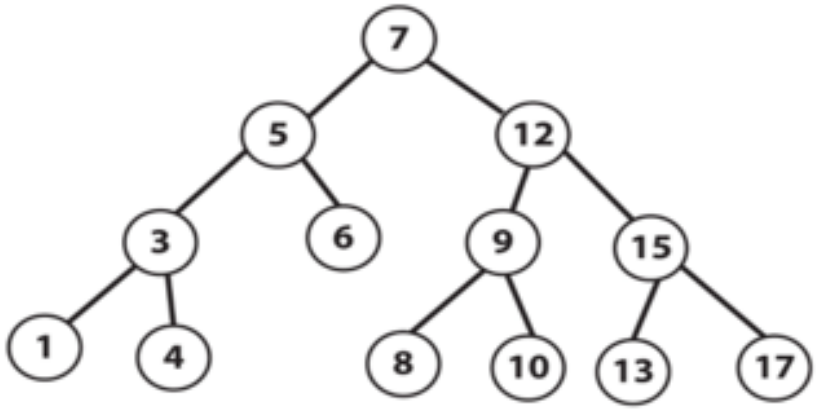
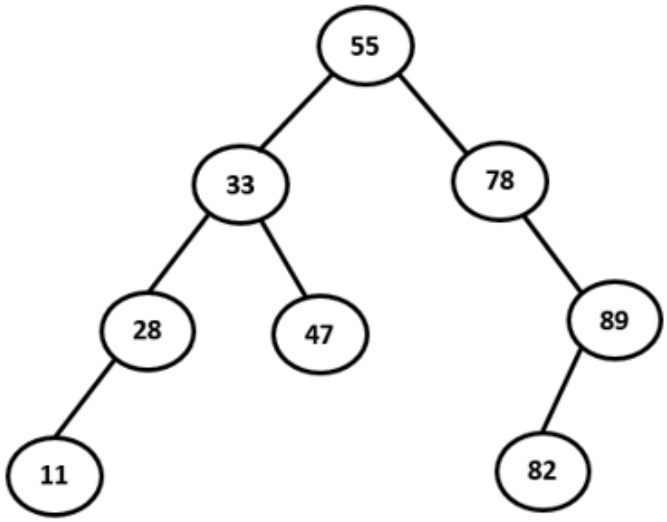
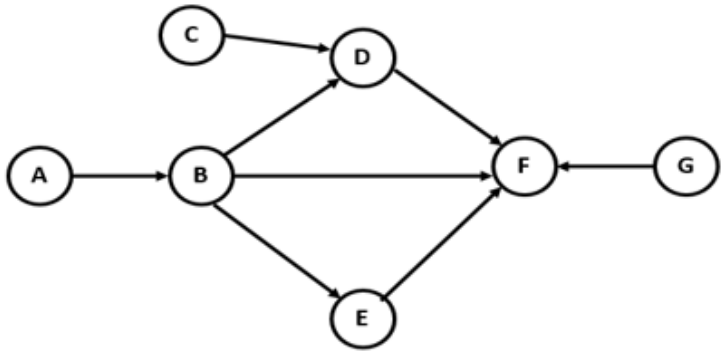
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	The postfix form of the infix expression **A + B * C /D - E + F** is
Option A:	ABCD*/+EF+-
Option B:	ABC*D/+E-F+
Option C:	ABC*D/EF-++
Option D:	ABCD*/EF++-
2.	If pointer p is pointing to the last node of the doubly linked list and insertLast () function is called to insert a newNode in the list then which statement needs to be executed.
Option A:	p→next=newNode; newNode→prev=p; newNode→next=NULL; p=newNode;
Option B:	newNode→prev=p; p→next=newNode; p→prev=NULL; newNode=p;
Option C:	p→prev=newNode; newNode→next=p;p=newNode;newNode→prev=NULL;
Option D:	newNode→next=p; p→next=newNode; newNode→prev=NULL; newNode=p;
3.	Given the following input (22, 34, 11, 68, 88, 41, 73, 98) and the hash function x mod 10, which of the following statements are true? i) All elements hash to the same value ii) 11, 41 hash to the same value iii) 68, 88, 98 hash to the same value iv) Each element hashes to a different value
Option A:	ii only
Option B:	iii only
Option C:	ii and iii
Option D:	i or iv
4.	Consider the Binary Search Tree given below and find the result of post-order traversal sequence 
Option A:	1 3 4 5 6 7 8 9 10 12 13 15 17
Option B:	1 4 3 6 5 8 10 9 13 17 15 12 7
Option C:	4 1 3 5 6 10 8 9 12 17 13 15 7
Option D:	17 13 15 10 8 9 12 6 4 1 3 5 7

5.	Which of the following are the applications of Queue? i. Resource shared by multiple users ii. Call Centre phone systems iii. Recursion iv. Data transfer asynchronously among client and server
Option A:	ii, iii
Option B:	i, ii, iii
Option C:	i, ii, iv
Option D:	i, iii, iv
6.	In a list of 150 elements if we wish to access the 79th element of list then _____ data structure will require less time to access the element.
Option A:	Stack
Option B:	Queue
Option C:	Linked List
Option D:	Array

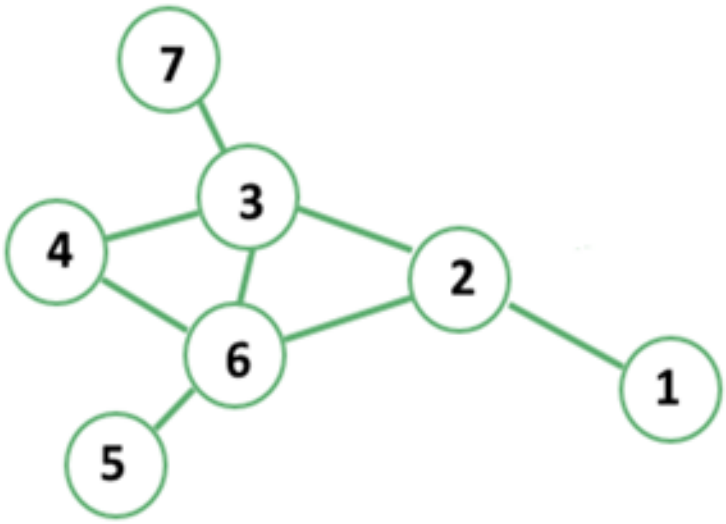
7.	For Linked List 10->20->30->40->50, What does the following function print with first node as head?
	`void fun1(struct node* head)`
	`{`
	`if(head == NULL)`
	`return;`
	`fun1(head->next->next);`
	`printf("%d ", head->data);`
	`}`

Option A:	10->20->30->40->50
Option B:	50->40->30->20->10
Option C:	10->30->50
Option D:	50->30->10
8.	If binary trees are represented in arrays, what formula can be used to locate a right child, if the node has an index i? (Assume array indexing starts with 0)
Option A:	2i-1
Option B:	2i+1
Option C:	2i+2
Option D:	2i-2

9.	What are the number of edges present in a complete graph having n vertices?
Option A:	(n+1)/2
Option B:	(n-1)/2
Option C:	(n*(n-1))/2
Option D:	(n*(n+1))/2
10.	What is the balance factor of the node 78 in the given tree? 
Option A:	1
Option B:	-1
Option C:	2
Option D:	-2

Q2 **(20 Marks)**	**Solve any Four out of Six** **5 marks each**
A	Explain Linear and Non-linear data structures with an example.
B	Write a C function for insertion of a node to the immediate right of the Key node in a doubly linked list.
C	Write a program to reverse a string using stack.
D	Why Circular queue is better than Linear Queue. Justify your answer with proper example.
E	Consider the given directed acyclic graph. Sort the nodes by applying topological sort on the graph. 
F	Create an expression tree for the following expressions. i) A + B * C/D – E ii) (3x+5)(6x-4)

Q3 (20 Marks)	**Solve any Two Questions out of Three** **10 marks each**
A	Consider a list that stores information about Employees where each node contains Employee Id, Employee Name and Salary. Write a C program to perform following operations on singly linked list: i) Create a singly linked list by inserting nodes at the beginning ii) Delete all nodes whose salary matches the given salary
B	Write a program in C to evaluate a given postfix expression. Show the simulation using stack for the following expression: 6 4 2 + 5 * + 8 -
C	How does the AVL tree differ from Binary Search Tree? Show the result of inserting 15, 19, 22, 10, 3, 37, 25, 12, 13 one at a time into an initially empty AVL Tree.

Q4 (20 Marks)	
A	**Solve any Two** **5 marks each**
i.	Write a program to add the values of the nodes of a linked list, Calculate the mean and display the result.
ii.	For the following graph, Show all the steps of the Depth First Search traversal starting with vertex 1. 
iii.	Write functions Insert_Front and Delete_Rear to insert and delete element from Double Ended Queue using array.
B	**Solve any One** **10 marks each**
i.	Using Linear Probing and modulo division method, hash the following elements into a table of size 11. 45,8, 33, 85, 61, 10, 48, 76, 59
ii.	Create a B tree of order 3 for the following data arriving in sequence: 90, 27, 7, 9, 18, 21, 3, 16, 11

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- YES

UOM Exam Second half 2021_Question paper_R2019/CSC304 - DLCA /Sem-III / COMPUTER ENGINEERING

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- For MCQs Question write Question number & correct option with complete text in option.
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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	What is the primary motivation for using Boolean algebra to simplify logic expressions?
Option A:	It may make it easier to understand the overall function of the circuit.
Option B:	It may reduce the number of gates.
Option C:	It may reduce the number of inputs required.
Option D:	All of the above
2.	The given hexadecimal number (1E.53)16 is equivalent to _____
Option A:	(35.684)8
Option B:	(36.246)8
Option C:	(34.340)8
Option D:	(35.599)8
3.	In restoring division algorithm, after performing operations (1) 1eft shift operation on A,Q and (2) A=A-M, if sign of A is positive?
Option A:	Q0=0, A=A+M
Option B:	A=A+M
Option C:	Q0=1
Option D:	A=A-M
4.	In Booth's multiplication algorithm, if Q0=1 and Q-1=1 then it will perform which operation,
Option A:	A=A-M
Option B:	A=A+M
Option C:	Arithmetic right shift of A, Q and Q-1
Option D:	A=M-A
5.	In a system the contents of PC, Base register, Register R0, and Register R1 has contents 60, 100, 10, and 20 respectively. Content of R1 is used as the displacement value. What is the effective address computed using the Base addressing and the Relative-Base addressing modes, respectively?
Option A:	120, 80
Option B:	110, 120
Option C:	120, 160
Option D:	120, 180

6.	A J-K flip-flop with J=1 and K=1 has a 20 KHz clock input. The Q output is _____
Option A:	Constantly LOW
Option B:	Constantly HIGH
Option C:	A 20 KHz square wave
Option D:	A 10 KHz square wave
7.	Which is the simplest method of implementing hardwired control unit?
Option A:	State Table Method
Option B:	Delay Element Method
Option C:	Sequence Counter Method
Option D:	Using Circuits
8.	Highly encoded schemes that use compact codes to specify a small number of functions in each micro instruction is _____
Option A:	Horizontal organization
Option B:	Vertical organization
Option C:	Diagonal organization
Option D:	Complex microinstruction organization
9.	Which of the following statement is TRUE?
Option A:	A direct mapped cache has higher hit time than a 4-way set associative cache with same of number of sets.
Option B:	Two 4 KB caches of same block size, but with different associativity will always have same hit rate.
Option C:	A set associative cache has lower number of conflict misses than a direct mapped cache of same size.
Option D:	During a cache miss, there will be block replacements in a fully associative cache if at least one of the cache location is empty.
10.	Which of the following statement is false with respect to instruction pipeline?
Option A:	Pipelining can increase the throughput of a system.
Option B:	Pipelining partitions the system into multiple independent stages with added buffers between the stages.
Option C:	Pipelining reduce the latency of each individual instruction.
Option D:	Unbalanced lengths of pipeline stages reduces overall speedup.

Q.2	**Solve any Two Questions out of Three.**		
	A)	Perform the following – i) Convert $(340)_{10}$ to excess-3 code. ii) Convert Hexadecimal to decimal: DADA iii) Draw OR gate using NAND gate. iv) Hexadecimal to binary conversion: 3A9D.A0C v) Represent $(52)_{10}$ into Gray code.	**10**
	B)	Draw flow chart for non-restoring division algorithm and perform the division operation 11/3 using non-restoring division algorithm.	**10**
	C)	Design a full adder using half adder and additional gates. Give its Boolean expression for Sum and Carry and truth table.	**10**
Q.3	**Solve any Two Questions out of Three.**		
	A)	With suitable steps convert decimal number 39887.5625 to IEEE 64-bit Double precision floating point representation.	**10**
	B)	With the help of diagram explain in brief: functioning of Micro programmed Control Unit.	**10**
	C)	What is Cache Memory? A 32-bit computer has a 32 bit memory address. It has 8kB of cache memory. The computer follows four-way set associative mapping. Each line size is 16 bytes. Show the memory address format and cache memory organization.	**10**
Q.4	**Solve any Two Questions out of Three.**		
	A)	What is Pipeline Hazard? Give the types of pipeline hazards. Write a difference between delayed branch and branch prediction.	**10**
	B)	With suitable diagram, explain the Flynn Classification of Computer organization.	**10**
	C)	Write a short note on Interleaved and Associative Memory.	**10**

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

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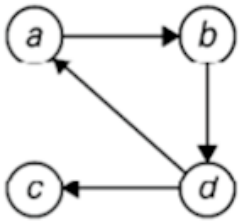
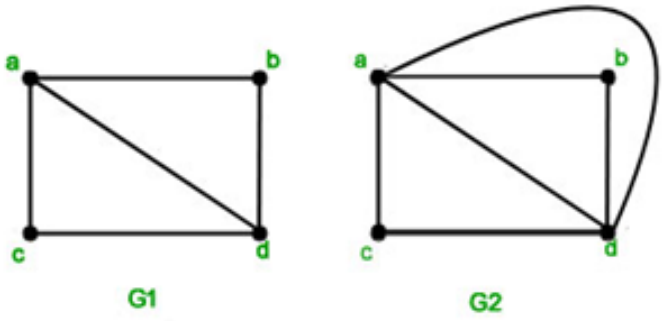
- Q2 to Q4 are subjective questions - Solve Questions as per the instructions and marks allotted.

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	How many subsets can be created for set A ={a,b,c,d}
Option A:	8
Option B:	12
Option C:	16
Option D:	20
2.	Let p be "John is happy" and q be "John is rich". Write the following in symbolic form. " John is poor but happy"
Option A:	~p ^ q
Option B:	~p V ~q
Option C:	~p V (p ^ ~q)
Option D:	~q ^ p
3.	Let R = {[(1,2)(1,3),(3,1),(1,1),(3,3),(3,2),(1,4),(3,4),(4,2)]} , determine which property is satisfied by above relation?
Option A:	Reflexive
Option B:	Symmetric
Option C:	Transitive
Option D:	Equivalence
4.	Given the following statements pick the one that a tautology?
Option A:	~p→ (q→p)
Option B:	(p ^ q)→ p
Option C:	p ^ ~ q
Option D:	q →~p
5.	Planner graph is a graph in which _____.
Option A:	Two edges of the graph intersect.
Option B:	No two edges of the graph intersect.
Option C:	All the edges of the graph intersect.
Option D:	Some edges of the graph intersect.
6.	Group has following Properties _____.
Option A:	Closure Associative, Inverse, Identity
Option B:	Closure, Associative, Identity, Commutative
Option C:	Closure, Associative, Identity, Inverse
Option D:	Closure, Associative, Identity element, Inverse element, Commutative

7.	The transitive closure of the relation R={(1,2),(2,3),(3,4)(5,4)} on set A={1,2,3,4,5} is
Option A:	{(1,2),(2,3),(3,4),(5,4),(1,3)}
Option B:	{(1,2),(2,3),(3,4),(5,4),(1,3),(1,4),(2,4)}
Option C:	{(1,2),(2,3),(3,4),(5,4),(1,3),(1,4)}
Option D:	{(1,2),(2,3),(3,4),(4,5),(1,3),(1,4)}
8.	A_____ is a semi group (A,*) that has an identity element.
Option A:	Cyclic group
Option B:	Lattice
Option C:	Poset
Option D:	Monoid
9.	K11 is a complete graph of 11 vertices and will have _____ edges.
Option A:	45
Option B:	54
Option C:	55
Option D:	42
10.	What is the identity element In the group G = {0, 1, 2, 3, 4, 5) under addition modulo 6?
Option A:	0
Option B:	1
Option C:	5
Option D:	4

Q2	
A	**Solve any Two** **[5 marks each]**
i.	Let A = {[1, 2, 3, 4, 5, 6, 7}] and R = {(a, b) | a-b is divisible by 3}. Show that R is an equivalence relation.
ii.	Prove that the set Z of all integers with binary operation * defined by a*b=a+b+1 for all a, b belonging to G is an Abelian group.
iii.	Obtain the Conjunctive Normal Form of (x ^ y) V (~x ^ y)
B	**Solve any One** **[10 marks each]**
i.	Let D72 be the poset consisting of all the positive divisors of 72 under the partial order of divisibility. (a) Write down the elements of D72? (b) Draw the Hasse Diagram of D72. (c) Define Lattice. Is D72 a lattice? Give a reason for your answer
ii.	Define and give examples of injective surjective and bijective functions. Check the injectivity and surjectivity of the following function f : N → N given by $f(x)=x^2$

Q3	
A	**Solve any Two** **[5 marks each]**
i.	Consider the following digraph and find transitive closure using Warshall's algorithm. 
ii.	Find the generating function for the following sequences i) {1, 1, 1, 1, 1, 1, ...} ii) {1, 2, 3, 4, ...}
iii.	Prove using Mathematical induction $1+3+5+\ldots\ldots+(2k-1)=k^2$ is true.
B	**Solve any One** **[10 marks each]**
i.	Define Isomorphic Graph. Draw K6 and K3, 3 graphs. Find whether they are Isomorphic or not?
ii.	Consider G = {1, 3, 5, 7} under the multiplication modulo 8. i) Find multiplication table of G. ii) Find $3^{-1}, 5^{-1}, 7^{-1}$ iii) Is G cyclic Group?

Q4.	
A	**Solve any Two** **[5 marks each]**
i.	Define Existential and Universal Quantifier. Let K(x): "x is a two-wheeler." L(x) : "x is a scooter", M(x): "x is manufactured by Bajaj". Express the following using Quantifiers: i) Every two-wheeler is a scooter ii) There is a two-wheeler that is not manufactured by Bajaj. *iii)* Every two- wheeler that is a scooter is manufactured by Bajaj.
ii.	How many numbers between 1 and 500 are divisible by 3 or 5 or 7.
iii.	Define Euler Path and Euler Circuit. Check whether Euler Path, Euler Circuit exist in the following graphs. 
B	**Solve any One** **[10 marks each]**
i.	Consider the set Q of rational numbers, and let '*' be the operation on Q defined by a * b = a+b-ab . i) Find 2 *4, 5 * (-4) ii) Show that (Q,*) is a semi group. iii) Is it commutative?
ii	Give the examples of relation R on A = {1, 2, 3} having stated property. i) R is transitive but not symmetric ii) R is symmetric but not transitive iii) R is both symmetric and antisymmetric iv) R is neither symmetric nor antisymmetric. v) R is equivalence

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UOM Exam Second half 2021_Question paper_R2019/CSC301 - Engineering Mathematics III /Sem-III / COMPUTER ENGINEERING

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- Please upload a single PDF for Q1 to Q4
- 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.

Q 1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks** **2 marks each**
1.	Laplace transform of $e^{-5t}(t^2+sin2t)$ *is*
Option A:	$\frac{2}{(s+5)^3}+\frac{2}{(s+5)^2+2^2}$
Option B:	$\frac{2}{(s-5)^3}+\frac{2}{(s-5)^2+4}$
Option C:	$\frac{3}{(s+5)^3}+\frac{s}{(s+5)^2+2^2}$
Option D:	$\frac{2}{(s+5)^2}+\frac{2}{(s+5)^2-2^2}$
2.	If $L\{F(t)\}=\frac{3s}{s^2+1}$, then $L\{F(2t)\}$ at s=1, is
Option A:	$\frac{3}{5}$
Option B:	$\frac{2}{5}$
Option C:	$-\frac{3}{5}$
Option D:	$\frac{7}{5}$
3.	Inverse Laplace transform of $\frac{1}{s^2+4}$ *is*
Option A:	$\int_0^t cos2udu$
Option B:	$\int_0^t sin2udu$
Option C:	$\int_0^t cos3udu$
Option D:	$\int_0^t cosudu$

4.	Inverse Laplace transform of f(s)= $\frac{6e^{-5s}}{(s+2)^4}$ *is*
Option A:	$f(t)=\begin{cases}0 & 0<t<5\\ e^{-2(t-5)}(t-5)^3 & t>5\end{cases}$
Option B:	$f(t)=\begin{cases}0 & 0<t<5\\ e^{-2(t-5)}(t-5)^4 & t>5\end{cases}$
Option C:	$f(t)=\begin{cases}0 & t>5\\ e^{-2t}t^3 & t<5\end{cases}$
Option D:	$f(t)=\begin{cases}0 & 0<t<5\\ e^{-2t}t^5 & t>5\end{cases}$
5.	If $f(z)=u(x,y)+iv(x,y)$ is analytic then $f'(z)$ *is equal to*
Option A:	$\frac{\partial u}{\partial x}-i\frac{\partial v}{\partial y}$
Option B:	$\frac{\partial u}{\partial x}+i\frac{\partial v}{\partial x}$
Option C:	$\frac{\partial u}{\partial y}+i\frac{\partial v}{\partial x}$
Option D:	$\frac{\partial u}{\partial x}-i\frac{\partial v}{\partial x}$
6.	The value of 'm' so that $2x-x^2+my^2$ is harmonic, is
Option A:	0
Option B:	-1
Option C:	1
Option D:	3
7.	The value of coefficient of correlation lies between
Option A:	0 to 1
Option B:	$-\infty$ *to* 1
Option C:	0 to ∞
Option D:	-1 to 1

8.	The rank correlation coefficients of the following data is

X	23	25	27	29	31	33
Y	43	45	47	49	51	53

Option A:	0
Option B:	-1
Option C:	1
Option D:	0.99
9.	Expansion of Fourier series of $f(x)=x$ in (-1, 1) is
Option A:	$f(x) = \sum_{n=1}^{\infty} \frac{2}{n\pi}(-1)^n \sin n\pi x$
Option B:	$f(x) = \frac{2}{\pi}\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin nx$
Option C:	$f(x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin n\pi x$
Option D:	$f(x) = \frac{2}{\pi}\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n} \sin n\pi x$
10.	What would be the expectation of the number of failures preceding the first success in an infinite series of independent trials with the constant probability of success p and failure q
Option A:	$\frac{p}{q}$
Option B:	$\frac{q}{p}$
Option C:	$\frac{p+1}{q}$
Option D:	$\frac{p^2}{q^2}$

<table>
<tr><td>Q 2.</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Find Laplace transform of $e^{-3t}t\sqrt{1-sin2t}$</td></tr>
<tr><td>B</td><td>Find inverse Laplace transforms of $\frac{5s^2-15s-11}{(s+1)(s-2)^2}$</td></tr>
<tr><td>C</td><td>Expand Fourier Series for $f(x)=\frac{1}{2}(\pi-x)$ in $(0,2\pi)$.</td></tr>
<tr><td>D</td><td>Find constants a, b, c, d and e, if
$(ax^4+bx^2y^2+cy^4+dx^2-2y^2)+i(4x^3y-exy^3+4xy)$
is analytic.</td></tr>
<tr><td>E</td><td>Ten students got the following percentage of marks in mathematics and statistics
<table>
<tr><td>Maths</td><td>78</td><td>36</td><td>98</td><td>25</td><td>75</td><td>82</td><td>90</td><td>62</td><td>65</td><td>39</td></tr>
<tr><td>Stats</td><td>84</td><td>51</td><td>91</td><td>60</td><td>68</td><td>62</td><td>86</td><td>58</td><td>53</td><td>47</td></tr>
</table>
Calculate the coefficient of correlation.</td></tr>
<tr><td>F</td><td>A bolt is manufactured by three machines A, B and C. A turns out twice as many times as B, and machines B and C produce equal number of items . 3% of bolts produced by A and B are defective and 5% of bolts produced by C are defective. All bolts are put into one stock pile and one is chosen from this pile. What is the probability that it is defective?</td></tr>
</table>

Q. 3 **Solve any Four out of Six** **5 marks each**

A By using Laplace transform, evaluate $\int_0^{\infty} \frac{sin2t+sin3t}{te^t}$

B By using Convolution theorem, find inverse Laplace transform of $\frac{s}{(s^2+1)(s^2+4)}$

C Expand Fourier Series for $f(x) = 1 - x^2$ in $(-1, 1)$

D Find the analytic function $f(z) = u + iv$, in terms of z, if $v = \frac{\sinh 2y}{\cosh 2y + \cos 2x}$

E Obtain the equations of the lines of regression for the following data.

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

F A random variable X has the following probability distribution

X	-2	-1	0	1	2	3
P	0.1	K	0.1	2K	0.2	3K

(i) Find the constant K. (ii) Find the mean and variance of X.

<table>
<tr><td>Q. 4</td><td>Solve any Four out of Six 5 marks each</td></tr>
<tr><td>A</td><td>Find Laplace transform of $\int_0^t e^{-2u}\cos^2 u\,du$</td></tr>
<tr><td>B</td><td>Find Inverse Laplace transform of $\frac{1}{s}\log\sqrt{\left(\frac{s^2+9}{s^2+16}\right)}$</td></tr>
<tr><td>C</td><td>Find the half range cosine series for f (x) = $(x-1)^2$; 0< x < 1</td></tr>
<tr><td>D</td><td>Find the family of curves orthogonal to the family of curves
$x^3y - xy^3 = c$</td></tr>
<tr><td>E</td><td>Fit a straight line of the form y=a+bx to the following data
<table>
<tr><td>X</td><td>1</td><td>3</td><td>5</td><td>7</td><td>8</td><td>10</td></tr>
<tr><td>Y</td><td>8</td><td>12</td><td>15</td><td>17</td><td>18</td><td>20</td></tr>
</table></td></tr>
<tr><td>F</td><td>A random variable x has probability density function
$f(x)=\begin{cases} kx^2e^{-x} & x>0,\quad k>0 \\ 0 & Otherwise \end{cases}$
Find ‘k’ and hence find mean and variance.</td></tr>
</table>

6. Please Upload complete scanned answer copy in a single PDF file. *

   Files submitted:

7. Have you uploaded correct scanned copy of the answer sheets. *

   Mark only one oval.

   ◯ YES