

# PGCET-2022

Seat No. \_\_\_\_\_

SUB: Computer Engineering

Time: 1 Hour 30 minutes

Instructions:

1. Ensure that all pages are printed.
2. Use Black ball pen only
3. Change in option is not allowed
4. There is no negative marking
5. Use of non-programmable scientific calculator is allowed

1.	What is the broadcast address of the network 172.30.206.0/24?			
	A	172.30.206.255	B	172.30.206.0
	C	172.30.206.254	D	172.30.206.1
2.	An identifier in the C programming language is any string of length 1 or more that contains only letters, digits and underscores(_) and begins with a letter or an underscore. What is the regular expression for the language of all C identifiers?  l(for "letter") to denote the regular expression a+b+...+z+A+B+...+Z  d(for "digit") to stand for 0+1+2+...+9			
	A	(l+d+_)*	B	(l+_)(l+d+_)*
	C	(_+l)(l+d+_)+	D	l*d*_*
3.	Minimize the following Boolean function using algebraic manipulation-  $F = ABC'D' + ABC'D + AB'C'D + ABCD + AB'CD + ABCD' + AB'CD'$			
	A	AC+AD	B	AB + CD
	C	AB+AC+AD	D	AB + AC
4.	_____ are example of a combinational circuit.			
	A	Shift Registers	B	Multiplexers
	C	Counters	D	Flip Flops
5.	What is 2's complement of 0011010110011100?			
	A	1100101011001011	B	1100101001100011
	C	1100101001100100	D	1100101011111111
6.	What is the Theta notation of an expression $3n^3 + 6n^2 + 6000$ ?			
	A	$\Theta(n^2)$	B	6000
	C	$\Theta(n)$	D	$\Theta(n^3)$

7.	Consider the following Transition diagram for finite automata with 3 states. Which language does it represent?																		
<table><tr><td></td><td colspan="2">input</td></tr><tr><td></td><td>0</td><td>1</td></tr><tr><td>A</td><td>A</td><td>B</td></tr><tr><td>B</td><td>10</td><td>B</td></tr><tr><td>10</td><td>A</td><td>B</td></tr></table>						input			0	1	A	A	B	B	10	B	10	A	B
	input																		
	0	1																	
A	A	B																	
B	10	B																	
10	A	B																	
A	(11+00+10)+		B	{0+1}+															
C	{0,1}*{10}		D	(00 +01+10)															
8.	What is the last valid host on the subnetwork 10.133.192.0 255.255.240.0?																		
A	10.133.192.255		B	10.133.207.254															
C	10.133.192.0		D	10.133.255.255															
9.	<b>What is the time, space complexity of the following code snippet:</b> int a = 0, b = 0; for (i = 0; i < N; i++) { a = a + rand(); } for (j = 0; j < M; j++) { b = b + rand(); }																		
A	O(N * M) time, O(1) space		B	O(N + M) time, O(N + M) space															
C	O(N + M) time, O(1) space		D	O(N * M) time, O(N + M) space															
10.	Given the following grammar, <input type="checkbox"/> S -> CC <input type="checkbox"/> C -> cC   d Which of the following statements is true?																		
A	The grammar is LL(1).		B	The grammar is LR(1) but not LALR(1).															
C	The grammar is SLR(1) but not LL(1).		D	The grammar is LR(1) but not LALR(1).															
11.	The gates required to build a half adder are _____																		
A	EX-OR gate and NOR gate		B	EX-OR gate and AND gate															
C	EX-OR gate and OR gate		D	EX-NOR gate and AND gate															

12.	Data Link Layer is divided into which two sublayers?			
	A	Logical Link Control (LLC), Bit synchronization control(BSC)	B	Bit synchronization control(BSC), Bit rate control(BRC)
	C	Logical Link Control (LLC), Media Access Control (MAC)	D	Media Access Control (MAC), Bit rate control(BRC)
13.	Consider the below given three address code, which expression does it represent? $r1 = c * d;$ $r2 = b + r1;$ $a = r2$			
	A	$a=c*d$	B	$a=b+c*d$
	C	$b=c*d$	D	$a+b=c*d$
14.	If $L_1$ and $L_2$ are context free languages, then language _____ is also context free language.			
	A	$L_1 / L_2$	B	$\neg L_2$
	C	$L_1 - L_2$	D	$L_1 L_2$
15.	How many components context-free grammar has?			
	A	2	B	3
	C	4	D	5
16.	Which of the following is NOT true of deadlock prevention and deadlock avoidance schemes?			
	A	In deadlock prevention, the request for resources is always granted if the resulting state is safe	B	In deadlock avoidance, the request for resources is always granted if the result state is safe
	C	Deadlock avoidance is less restrictive than deadlock prevention	D	Deadlock avoidance requires knowledge of resource requirements a priori
17.	The data in the transport layer is referred to as _____.			
	A	Frame	B	Segments
	C	Packet	D	bits
18.	Consider the relation schema Singer(singer name, song name) What is the highest normal form satisfied by the "Singer" relation schema?			
	A	1NF	B	2 NF
	C	BCNF	D	3 NF
19.	A CPU has 24-bit instructions. A program starts at address 300 (in decimal). Which one of the following is a legal program counter (all values in decimal)?			

	A	400	B	600
	C	500	D	700
20.	In 16 bit 2's complement representation, the decimal number -28 is _____			
	A	111111111100100	B	111111100011100
	C	0000000011100100	D	1000000011100100
21.	The carry propagation can be expressed as _____			
	A	$C_p = AB$	B	$C_p = A \text{ EXOR } B$
	C	$C_p = A + B$	D	$C_p = A + \bar{B}$
22.	A push down automata uses which data structure?			
	A	Queue	B	Linked list
	C	Hash table	D	stack
23.	Consider an array of length (n) with following cases : If (n) is even then output will be 0 If (n) is odd then output will be the sum of the elements of the array. What is the best case for above problem?			
	A	Order of growth will be constant because best case assumes that (n) is even	B	Order of growth will be linear because best case assumes that even and odd are equally likely
	C	Order of growth will be linear because best case assumes that (n) is always odd.	D	Best case does not occur
24.	What is the output of the following program? <pre>#include&lt;stdio.h&gt;  void f() {     printf("Hello\n"); } main() {     ; }</pre>			
	A	No output	B	Error as the function is not called
	C	Error as function is defined without declaration	D	Error as main() function is empty
25.	Parity method for error detection is _____			

	A	Best suited for detecting single bit error in transmitted code.	B	Not suitable for detecting single bit error in transmitted code.
	C	Capable of detecting and correcting errors in transmitted code.	D	Best suited for detecting double bit errors that occur during transmission of codes.
26.	Which of the following logic expressions is incorrect ?			
	A	$1 \oplus 0 = 1$	B	$1 \oplus 1 \oplus 1 = 1$
	C	$1 \oplus 1 \oplus 0 = 1$	D	$1 \oplus 1 = 0$
27	Which of the following problems is not NP complete?			
	A	Hamiltonian circuit	B	Bin packing
	C	Partition problem	D	Halting problem
28	In Go-Back-N ARQ, if 5 is the number of bits for the sequence number, then the maximum size of the receive window must be _____			
	A	31	B	15
	C	32	D	1
29	Huffman tree is constructed for the data {A,B,C,D,E} with frequency {0.17,0.11,0.24,0.33 and 0.15} respectively. 1000001101 is decoded as _____			
	A	BACE	B	CADE
	C	BAD	D	CADD
30	An association of various entities in an Entity-Relation model is known as _____			
	A	Relationship	B	Record
	C	Tuple	D	Field
31	Ethernet uses _____ mechanism			
	A	Token ring	B	Critical section
	C	Virtual ring	D	CSMA/CD
32	In a compiler, keywords of a language are recognized during _____			
	A	parsing of the program	B	the code generation
	C	the lexical analysis of the program	D	dataflow analysis

33	Consider the following table for processes and burst time. If shortest job first scheduling algorithm is applied, what is the average waiting time?			
	Process		Burst	
	P1		8	
	P2		6	
	P3		1	
34	P4		9	
	P5		3	
	A	12.2	B	17.6
35	C	6.6	D	12
	A Gateway identifies _____ layer address.			
	A	Data link	B	Data link, Network and Transport
36	C	Data link, Network	D	Physical
	Let the page fault service time be 10ms in a computer with average memory access time being 20ns. If one page fault is generated for every 106 memory accesses, what is the effective access time for the memory?			
	A	21 ns	B	30 ns
37	C	23 ns	D	35 ns
	In the _____ protocol we avoid unnecessary transmission by sending only frames that are corrupted.			
	A	Stop-and-Wait ARQ	B	Go-Back-N ARQ
38	C	Selective-Repeat ARQ	D	None of the above
	The process of hiding the details of entities in the ER model is known as?			
	A	generalization	B	abstraction
39	C	specialization	D	derivation
	In ____, there are a set of possible atomic values that apply to an attribute.			
	A	Attribute	B	Instance
40	C	Domain	D	Schema
	Two 4 bit binary numbers (1011 and 1111) are applied to a 4 bit parallel adder. The carry input is 1. What are the values for the sum and carry output?			
	A	$\sum_4 \sum_3 \sum_2 \sum_1 = 0111 \quad C_{out} = 0$	B	$\sum_4 \sum_3 \sum_2 \sum_1 = 1111 \quad C_{out} = 1$

	C	$\sum_4 \sum_3 \sum_2 \sum_1 = 1011 \quad C_{out} = 1$	D	$\sum_4 \sum_3 \sum_2 \sum_1 = 1100 \quad C_{out} = 1$
40	The TCP/IP model does not have ____ and ____ layers but ____ layer include required functions of these layers.			
	A	Session, Application, Presentation	B	Presentation, Application, Session
	C	Session, Presentation, Application	D	Link, Internet, Transport
41	The operation of a relation X, produces Y, such that Y contains only selected attributes of X. Such an operation is _____			
	A	Projection	B	Intersection
	C	Union	D	Difference
42	<p>Consider the language <math>L_1, L_2, L_3</math> given below</p> <p><math>L_1 = \{0^p 1^q \mid p, q \in \mathbb{N}\}</math></p> <p><math>L_2 = \{0^p 1^q \mid p, q \in \mathbb{N} \text{ and } p=q\}</math></p> <p><math>L_3 = \{0^p 1^q 0^r \mid p, q, r \in \mathbb{N} \text{ and } p=q=r\}</math></p> <p>Out of the three languages, which language can be recognized by Pushdown Automata(PDA)?</p>			
	A	$L_3$	B	$L_1$ and $L_2$
	C	$L_2$ and $L_3$	D	$L_1$ and $L_3$
43	With SQL, how do you select a column named "FirstName" from a table named "Persons"?			
	A	Select FirstName from Persons	B	Extract FirstName from Persons
	C	Select Persons.FirstName	D	Get Persons.FirstName
44	Which is the delay element for clocked system?			
	A	AND Gates	B	Flip-Flops
	C	OR Gates	D	Multiplexer
45	What is the Worst Case Time Complexity of Quick Sort?			
	A	$O(N \log N)$	B	$O(N^2)$
	C	$O(N)$	D	$O(N \log \log N)$
46	Which of the following protocol is used to retrieve emails?			
	A	SMTP	B	POP3
	C	FTP	D	SNMP

47	Which of the following problem cannot be solved using dynamic programming?			
	A	0/1 knapsack problem	B	Matrix chain multiplication problem
	C	Edit distance problem	D	Fractional knapsack problem
48	Subtract $(1010)_2$ from $(1101)_2$ using 1's complement.			
	A	$(1100)_2$	B	$(0011)_2$
	C	$(1001)_2$	D	$(0101)_2$
49	Consider two languages, L1 and L2. L1 is context-free, and L2 is recursively enumerable but not recursive. Which among the following is/are necessarily true?  1. The complement of $L1(L1')$ is recursive 2. The complement of $L2(L2')$ is recursive 3. $L1'$ is context-free 4. $L1' \cup L2$ is recursively enumerable			
	A	1 only	B	3 only
	C	3 and 4 only	D	1 and 4 only
50	With SQL, how can you insert a new record into the "Persons" table?			
	A	insert values ('XYZ' 'ABC') into Persons	B	insert ('XYZ','ABC') into Persons
	C	insert into Persons values ('XYZ','ABC')	D	Insert into Persons
51	In which data structure, the null pointer in the last node is replaced with the address of the first node.			
	A	Doubly linked list	B	Circular linked list
	C	Array	D	Singly linked list
52	Which protocol generates Error " <i>destination network unreachable</i> "?			
	A	ICMP	B	DNS
	C	FTP	D	HTTP
53	The decimal equivalent of the binary number $(1011.011)_2$ is _____			
	A	$(11.375)_{10}$	B	$(10.123)_{10}$
	C	$(11.175)_{10}$	D	$(9.23)_{10}$

54	An unordered list contains n distinct elements. The number of comparisons to find an element in this list that is neither maximum nor minimum is ____			
	A	$\Theta(n \log n)$	B	$\Theta(n)$
	C	$\Theta(\log n)$	D	$\Theta(1)$
55	D Flip-flop can be made from a J-K flip flop by making _____			
	A	$J=K$	B	$J=K=1$
	C	$J=0 \ K=1$	D	$J=\bar{K}$
56	What is the keyword used to define a domain alias?			
	A	NS	B	CNAME
	C	MX	D	PTR
57	The following message is displayed on the browser, while trying to access a URL  Server; Error 404  The reason for the message:			
	A	The requested resource is no longer available or, more specifically, just not found.	B	Internal server error.
	C	URL authorization store cannot be opened	D	Header values specify a configuration that is not implemented.
58	Consider a language L given by  $L = \{a^p \mid p \text{ is a prime}\}.$  The language will be accepted by ____			
	A	Turing machine	B	Finite Automata
	C	Push down automata	D	Transition diagram
59	A Single-Precision floating-point number occupies 32-bits, out of 32 bits mantissa is ____ bits			
	A	1	B	16
	C	8	D	23
60	HTTP protocol have ____ - handshakes.			
	A	2 Way	B	5 Way
	C	3 Way	D	1 Way

61	In case of Zero Address instruction method, the operands are stored in _____			
	A	Registers	B	Accumulator
	C	Push down stack	D	Cache
62	Multiplication of (10.10) and (01.01), is _____			
	A	101.0010	B	011.0010
	C	0010.101	D	110.0011
63	What of the following device is used in the network layer?			
	A	Application Gateway	B	Switch
	C	Router	D	Repeater
64	Network layer firewall has two sub-categories as _____			
	A	State ful firewall and stateless firewall	B	Bit oriented firewall and byte oriented firewall
	C	Frame firewall and packet firewall	D	Network layer firewall and session layer firewall
65	The preorder traversal of binary search tree is 15,10,12,11,20,18,16,19 Which one of the following is post order traversal of the tree?			
	A	10,11,12,15,16,18,19,20	B	11,12,10,16,19,18,20,15
	C	20,19,18,16,15,12,11,10	D	19,18,16,20,11,12,10,15
66	Consider a complete graph G with 4 vertices. The graph G has ____ spanning trees.			
	A	15	B	8
	C	16	D	13
67	The addressing mode, where operand is directly specified is _____			
	A	Immediate	B	Direct
	C	Definite	D	Relative
68	Identify among the following which belongs to class A.			
	A	121.12.12.148	B	128.21.21.148
	C	129.21.21.148	D	130.21.21.148
69	A digital signature is a mathematical technique which validates?			
	A	integrity	B	Availability
	C	Man – in –the - middle	D	Authenticity

70	The travelling salesman problem can be solved using _____			
	A	A spanning tree	B	A minimum spanning tree
	C	Bellman Ford	D	DFS traversal
71	Let $\Sigma$ be the encoding of a Turing machine as a string over $\Sigma = \{0, 1\}$ . Let $L = \{  M \text{ is a Turing machine that accepts a string of length } 2014 \}$ . Then, L is _____			
	A	decidable and recursively enumerable	B	undecidable but recursively enumerable
	C	undecidable and not recursively enumerable	D	decidable but not recursively enumerable
72	A Distance Vector router running distance vector protocol advertises its connected routes and learns new routes from its _____.			
	A	router	B	Node itself
	C	link	D	neighbors
73	To implement Dijkstra's shortest path algorithm on unweighted graphs so that it runs in linear time, the data structure to be used is _____			
	A	Queue	B	Stack
	C	Heap	D	B-tree
74	In which mode the operand is placed in one of 8 bit or 16 bit general purpose registers?			
	A	Immediate addressing	B	Register mode
	C	Implied addressing	D	Register Indirect
75	Which of these systems use timestamps as an expiration date?			
	A	Public key certificates	B	Public announcements
	C	Publicly available directories	D	Public key authority
76	In link state routing, the updating packets are sent _____			
	A	Periodically at fixed interval	B	When a node demands
	C	When there is a change	D	At Random interval
77	Which one of the following testing is performed by user?			
	A	Acceptance testing	B	Unit testing
	C	Integration testing	D	Compatibility testing

78	Given the following input (4322, 1334, 1471, 9679, 1989, 6171, 6173, 4199) and the hash function $x \bmod 10$ , which of the following statements are true?			
	i. 9679, 1989, 4199 hash to the same value ii. 1471, 6171 hash to the same value iii. All elements hash to the same value iv. Each element hashes to a different value			
	A	i only	B	ii only
79	C	i and ii only	D	iii or iv
	A ___ binary search tree is a B+ tree.			
	A	balanced	B	unbalanced
80	C	Positive	D	Branch positive
	Simple mail transfer protocol (SMTP) utilizes ___ as the transport layer protocol for electronic mail transfer.			
	A	TCP	B	UDP
81	C	DCCP	D	OSPF
	Consider a system of linear equations $Ax = 0$ with $\det A = 0$ . Then the system has			
	A	Infinite solutions	B	A unique solution
82	C	No solution	D	None of these
	If $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ , then one of the eigen values of the matrix $A^4 + A + I$ is			
	A	81	B	84
83	C	83	D	85
	The median of the observations 110, 115, 112, 120, 116, 135, 128, 132 is			
	A	114	B	116
84	C	118	D	120
	If $P(A) = \frac{1}{3}$ , $P(B) = 1/4$ and $P(A \cup B) = 1/2$ then the conditional probability $P(B/A)$ is equal to			
	A	1/3	B	1/4
85	C	1/2	D	1/12
	Which of the following methods is not used for solving a non-linear algebraic equation?			
	A	Bisection method	B	Gauss Jordan method

	C	Newton Raphson method	D	Secant method
86	Which of the following equations represent one dimensional wave equation?			
	A	$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial u}{\partial x}$	B	$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$
	C	$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$	D	$\frac{\partial^2 u}{\partial x \partial t} = c^2 \frac{\partial u}{\partial x}$
87	The inverse Laplace transform of $F(s) = \frac{1}{\sqrt{2s+3}}$ is			
	A	$\frac{1}{\sqrt{2\pi t}} e^{\frac{-3t}{2}}$	B	$\frac{\pi}{\sqrt{2\pi t}} e^{\frac{-3t}{2}}$
	C	$\frac{1}{\sqrt{2t}} \pi e^{\frac{-3t}{2}}$	D	$\frac{1}{\pi \sqrt{2t}} e^{\frac{-3t}{2}}$
88	The Laplace transform of $f(t) = t \cos t$ is			
	A	$\frac{s}{(s^2 + 1)^2}$	B	$\frac{s + 1}{(s^2 + 1)^2}$
	C	$\frac{s - 1}{(s^2 + 1)^2}$	D	$\frac{s^2 - 1}{(s^2 + 1)^2}$
89	Which of the following differential equations is linear?			
	A	$y' + 2xy = 3y^2$	B	$yy' + 2x = y$
	C	$y' + 2xy = x^2$	D	$yy' + 2x = 1$
90	The solution of the initial value problem $x \, dx + y \, dy = 0, y(0) = 1$ represents			
	A	A family of circles	B	The unit circle
	C	An ellipse	D	A family of straight lines
91	If the general solution of the differential equation $(D^3 - 3D^2 - D + 3)y = 0$ is $y = c_1 e^{\alpha_1 x} + c_2 e^{\alpha_2 x} + c_3 e^{\alpha_3 x}$ then the product $\alpha_1 \alpha_2 \alpha_3$ is equal to			
	A	3	B	-3
	C	1	D	-1
92	If $z = f(x, y) = \tan^{-1}\left(\frac{y}{x}\right)$ then the value of $\frac{\partial^2 z}{\partial x^2}$ at the point (1,1) is			
	A	1	B	2
	C	$\frac{1}{2}$	D	0
93	If $f(x, y) = x^2 y - xy^2 + 4xy - 4x^2 - 4y^2$ then (0,0) is			
	A	A point of maxima	B	A point of minima

	C	A saddle point	D	None of these
94	The equation of the tangent plane to the surface $x^2 + y^2 + z^2 = 3$ at the point (1,1,1) is			
	A	$x + y + z = 0$	B	$x + y + z = 3$
	C	$x + y + z = 6$	D	$x + y + z = 12$
95	$f(x) =  x  \sin x$ at $x = 0$ is			
	A	Both continuous and differentiable	B	continuous but not differentiable
	C	Differentiable but not continuous	D	Neither continuous nor differentiable
96	If $f$ is continuous on $[0,1]$ and differentiable on $(0,1)$ then the sufficient condition so that $f'(c) = 0$ for some $c \in (0,1)$ is			
	A	$f(0) - f(1) = 0$	B	$f(0) - f(1) < 0$
	C	$f(0) - f(1) > 0$	D	$f(0) + f(1) = 0$
97	If the vector field $\vec{F}$ is gradient of a scalar field $\phi(x, y, z) = x^2 + y^2 + 2z^2$ then the value of the line integral $\int_C \vec{F} \cdot d\vec{r}$ from $A(0,0,0)$ to $B(2,2,2)$ along the straight line joining the points A and B is			
	A	4	B	8
	C	16	D	0
98	Which of the following statements is false about the complex function $e^z$ ?			
	A	It is analytic in the entire complex plane $C$	B	It is bounded in the entire complex plane $C$
	C	$\int_C e^z dz = 0$ for any simple closed curve $C$ .	D	None of these
99	The coefficient of $z^2$ in the Taylor series expansion of $f(z) = e^z - 1$ about $z = 0$ is			
	A	0	B	1
	C	2	D	1/2
100	If A is a non-singular matrix of order 3 then which of the following statements is false?			
	A	A is invertible	B	Rank A = 3
	C	AB is a non-singular matrix whenever B is non-singular matrix of order 3	D	None of these