

## Question Papers

1 The problems 3-SAT and 2-SAT are

- A) both in P
- B) both NP-complete
- C) NP-complete and in P respectively
- D) undecidable and NP-complete respectively

Answer : (C)

2 Consider the following relation schema pertaining to a students database: Student (rollno, name, address) Enroll (rollno, courseno, coursename)

where the primary keys are shown underlined. The number of tuples in the Student and Enroll tables are 120 and 8 respectively. What are the maximum and minimum number of tuples that can be present in (Student \* Enroll), where '\*' denotes natural join?

- A) 8, 8
- B) 120, 8
- C) 960, 8
- D) 960, 120

Answer : (C)

3 Consider a relation scheme  $R = (A, B, C, D, E, H)$  on which the following functional dependencies hold :  $(A \rightarrow B, BC \rightarrow D, E \rightarrow C, D \rightarrow A)$ . What are the candidate keys of R?

- A) AE, BE
- B) AE, BE, DE
- C) AEH, BEH, BCH
- D) AEH, BEH, DEH

Answer : (D)

4 The goal of structured programming is to

- A) have well indented programs
- B) be able to infer the flow of control from the compiled code
- C) be able to infer the flow of control from the program text
- D) avoid the use of GOTO statements

Answer : (C)

5 The tightest lower bound on the number of comparisons, in the worst case, for comparison-based sorting is of the order of

- A) n
- B)  $n^2$
- C)  $n \log n$
- D)  $n \log^2 n$

Answer : (B)

6 A circuit outputs a digit in the form of 4 bits. 0 is represented by 0000, 1 by 0001, ..., 9 by 1001. A combinational circuit is to be designed which takes these 4 bits as input and outputs

1 If the digit  $^3 5$ , and 0 otherwise. If only AND, OR and NOT gates may be used, what is the minimum number of gates required

- A) 2
- B) 3
- C) 4
- D) 5

Answer : (C)

7 WA and B are the only two stations on an Ethernet. Each has a steady queue of frames to send. Both A and B attempt to transmit a frame, collide, and A wins the first backoff race. At the end of this successful transmission by A, both A and B attempt to transmit and collide. The probability that A wins the second backoff race is

- A) 0.5
- B) 0.625
- C) 0.75
- D) 1.0

Answer : (A)

8 If  $73x$  (in base- $x$  number system) is equal to  $54y$  (in base- $y$  number system), the possible values of  $x$  and  $y$  are

- A) 8, 16
- B) 10, 12
- C) 9, 13
- D) 8, 11

Answer : (D)

9 In a packet switching network, packets are routed from source to destination along a single path having two intermediate nodes. If the message size is 24 bytes and each packet contains a header of 3 bytes, then the optimum packet size is

- A) 4
- B) 6
- C) 7
- D) 9

Answer : (D)

10 A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is given below: 10, 8, 5, 3, 2 Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is

- A) 10, 8, 7, 5, 3, 2, 1
- B) 10, 8, 7, 2, 3, 1, 5
- C) 10, 8, 7, 1, 2, 3, 5
- D) 10, 8, 7, 3, 2, 1, 5

Answer : (D)

11 Consider an operating system capable of loading and executing a single sequential user process at a time. The disk head scheduling algorithm used is First Come First Served (FCFS).

If FCFS is replaced by Shortest Seek Time First (SSTF), claimed by the vendor to give 50% better benchmark results, what is the expected improvement in the I/O performance of user programs ?

- A) 50%
- B) 40%
- C) 25%
- D) 0%

Answer : (D)

12 How many distinct binary search trees can be created out of 4 distinct keys?

- A) 5
- B) 14
- C) 24
- D) 42

Answer : (B)

Q-13 Select the one true statement. A) Every binary tree is either complete or full.

- B) Every complete binary tree is also a full binary tree.
- C) Every full binary tree is also a complete binary tree
- D) No binary tree is both complete and full.

Q-14 Which data structure has the fastest insertion procedure? A) Binary search tree

- B) Ordered array
- C) Heap
- D) Unordered linked list
- E) Ordered linked list

Q-15 What are the complexities of the insert, remove and search methods of a binary search tree in the worst case? A) insert is  $O(n)$ , remove is  $O(n)$ , search is  $O(n)$

- B) insert is  $O(\log n)$ , remove is  $O(\log n)$ , search is  $O(n)$
- C) insert is  $O(\log n)$ , remove is  $O(\log n)$ , search is  $O(\log n)$
- D) insert is  $O(\log n)$ , remove is  $O(\log n)$ , search is  $O(1)$
- E) These methods can't be defined on a binary search tree

Q-16 This Ethernet frame type is characterized by its use of the code AA in the SAP fields. A)

- Ethernet II
- B) Ethernet RAW
- C) Ethernet 802.2
- D) Ethernet SNAP

Q-17 Which of the following are examples of routed protocols? (Choose all that apply) A) IP

- B) IPX
- C) RIP
- D) OSPF
- E) AppleTalk

Q-18 If switches are used to replace hubs on a network, which of the following statements is

- true? A) The number of broadcast domains will decrease  
B) The number of collision domains will increase  
C) The number of collision domains will decrease  
D) The number of broadcast domains will be zero

Q-19 Full duplex Ethernet communication is only possible when:

- A. Systems are connected to same LAN segments  
B. Systems are connected to a bridged ports  
C. Systems are connected to their own switch port  
D. Systems are running over a fiber optic connection

Q-20 SQL is the combination of

- A ) DDL and DQL  
B ) DDL , DML and DQL  
C ) DDL,DML,DQL and DCL  
D ) None of these

Q-21 Which of the following applications may use a stack?

- A) A parentheses balancing program.  
B) Keeping track of local variables at run time.  
C) Syntax analyzer for a compiler.  
D) All of the above

Q -22 Consider the implementation of the Stack using a partially-filled array. What goes wrong if we try to store the top of the Stack at location [0] and the bottom of the Stack at the last used position of the array?

- A) Both peek and pop would require linear time.  
B) Both push and pop would require linear time.  
C) The Stack could not be used to check balanced parentheses.  
D) The Stack could not be used to evaluate postfix expressions.

Q-23 Select the one true statement.

- A) Every binary tree is either complete or full.  
B) Every complete binary tree is also a full binary tree.  
C) Every full binary tree is also a complete binary tree  
D) No binary tree is both complete and full.

Q-24 Which data structure has the fastest insertion procedure? A) Binary search tree

- B) Ordered array  
C) Heap  
D) Unordered linked list  
E) Ordered linked list

Q-25 What are the complexities of the insert, remove and search methods of a binary search tree in the worst case? A) insert is  $O(n)$ , remove is  $O(n)$ , search is  $O(n)$   
B) insert is  $O(\log n)$ , remove is  $O(\log n)$ , search is  $O(n)$   
C) insert is  $O(\log n)$ , remove is  $O(\log n)$ , search is  $O(\log n)$   
D) insert is  $O(\log n)$ , remove is  $O(\log n)$ , search is  $O(1)$   
E) These methods can't be defined on a binary search tree

Q-26 This Ethernet frame type is characterized by its use of the code AA in the SAP fields.  
A) Ethernet II  
B) Ethernet RAW  
C) Ethernet 802.2  
D) Ethernet SNAP

Q-27 Which of the following are examples of routed protocols? (Choose all that apply) A) IP  
B) IPX  
C) RIP  
D) OSPF  
E) AppleTalk

Q-28 If switches are used to replace hubs on a network, which of the following statements is true? A) The number of broadcast domains will decrease  
B) The number of collision domains will increase  
C) The number of collision domains will decrease  
D) The number of broadcast domains will be zero

Q-29 Full duplex Ethernet communication is only possible when:

- A. Systems are connected to same LAN segments
- B. Systems are connected to a bridged ports
- C. Systems are connected to their own switch port
- D. Systems are running over a fiber optic connection

Q-30 SQL is the combination of

- A ) DDL and DQL
- B ) DDL , DML and DQL
- C ) DDL,DML,DQL and DCL
- D ) None of these

Q-31 Which of the following applications may use a stack?

- A) A parentheses balancing program.
- B) Keeping track of local variables at run time.
- C) Syntax analyzer for a compiler.
- D) All of the above

Q -32 Consider the implementation of the Stack using a partially-filled array. What goes

wrong if we try to store the top of the Stack at location [0] and the bottom of the Stack at the last used position of the array?

- A) Both peek and pop would require linear time.
- B) Both push and pop would require linear time.
- C) The Stack could not be used to check balanced parentheses.
- D) The Stack could not be used to evaluate postfix expressions.

### **Dedicated Freight Corridor Corporation of India (DFCCIL)**

1. Dissolving salt in water is an example of which type of change ?

Physical-Answer

Nuclear

Chemical

Biochemical

2. When nuclear change takes place, which is true

Energy is destroyed

Energy is released-Answer

Energy is changed

None of these

3. Which type of radiation is unaffected by magnetism ?

Alpha

Beta

Gamma-Answer

All of these

4. Which temperature scale is an absolute scale, where the zero point is the lowest possible temperature ?

Kelvin-Answer

Celsius

Fahrenheit

Centigrade

5. The relative randomness of molecules in the states of matter is best indicated by

Solid > Liquids > Gas-Answer

Liquid > Gas > Solid

Liquid > Solid > Gas

Gas > Liquid > Solid

6. Whether or not two liquids are miscible is determined by

Molecular Size : Molecules of similar sizes tend to mix together

Density : Liquids of similar densities usually mix well together

Polarity : Polar and nonpolar liquids are not miscible while polar liquids can usually be mixed with each other-Answer

All of the above factors directly affect miscibility

7. The Triple Point is

The combination of standard temperature, pressure and volume

The combination of temperature and pressure at which the solid, liquid and gas phases can coexist at equilibrium

The combination of pressure and temperature at which liquid, gas, and plasma phases all exist in equilibrium-Answer

The combination of temperature and pressure at which liquids and gases cannot be distinguished from each other

8. If the work done by a force depends only on the initial and final stages and not on the path taken, then this type of force will be

Conservative Force-Answer

Non-conservative Force

Conservative as well as Non-conservative force

None of these

9. Working between which pair of following temperatures, the efficiency of a carnot engine will be maximum ?

10 Degrees F and 10 Degress R-Answer

10 Degrees F and 10 Degress C

10 Degrees R and 10 Degress C

It will be same in all the above cases

10. Dacron is a

Polyester-Answer

Polyamide

Nylon

Resin

11. Which of the following has the highest stable atom ?

Bi

Al

Cl

Pb-Answer

12. In Friedel-Crafts reaction,  $AlCl_3$  acts as a

Lewis Acid-Answer

Lewis Base

Catalyst

Reactant

13. The number of unpaired electrons in  $[Ni(CO)_4]$  is

Zero-Answer



One

Three

Five

14. Iodoethane reacts with sodium to form

Pentane

Propane

Butene

Butane-Answer

15. An ideal gas has maximum density at

1 atm, 300 K

2 atm, 150 K-Answer

0.5 atm, 600 K

1 atm, 500 K

16. Which of the following metals is present in brass, bronze and german silver ?

Defence Mechanism

Hydrolysis of ATP

Trifling of Contraction-Answer

Generating right electrical potential across cell membrane

17. First ionization potential is \_\_\_\_\_ second ionization potential.

Less than-Answer

More than

Equal to

None of these

18. n-propyl benzene is best prepared by

Friedel-Crafts Reaction

Wurtz Reaction

Wurtz-Fitting Reaction-Answer

Grignard Reaction

19. Chloroform is slowly oxidized by air to

Formly Chloride

Carbonyl Chloride-Answer

Trichloroacetic Acid

Formic Acide

20. Electrophoresis is

Movement of colloidal particle under the influence of electric field-Answer

Movement of colloidal particle under the influence of magnetic field

Movement of colloidal particle in zig-zag fashion

Scattering of light by colloidal particles

21. Rosenmund's reduction of an acyl chloride gives

Alcohol

Ester

Hydrocarbon

Aldehyde-Answer

22. Pyrophosphoric acid is

Monobasic

Dibasic-Answer

Tribasic

Basic

23. Which of the following is an example of a mathematical model ?

Area of a circle =  $\pi \times \text{Radius}^2$

Volume of a cube =  $\text{Length}^3$

Force = Mass x Acceleration

All of the above-Answer

24. The specific activity of an enzyme is relatively constant between pH 3-8. If the enzyme activity at pH 7.0 is to be modeled, which of the following would be a reasonable simplifying assumption ?

Specific activity is not dependent on temperature

Specific activity is not dependent on substrate concentration

Specific activity is not dependent on pH-Answer

All of the above

25. The bioreactor which is most commonly used in industry is the

Batch Fermenter

Fed Batch Fermenter-Answer

Continuous Fermenter

Batch Continuous Fermenter

26. Which of the following is correct with regards to microbial growth ?

Cells are autocatalysts and thus the rate of increase in biomass ( $dX/dt$ ) keeps changing

Many factors affect cell growth

The rate of increase in biomass concentration is not constant during a fermentation

All of the above are correct-Answer

27. During a batch fermentation, when would the specific growth rate be lowest ?

During exponential phase

During the lag and stationary phase-Answer

When cells are growing at their fastest rate

Throughout the fermentation

28. Which of the following describes a limitation of the exponential growth model ?

Biomass growth is assumed to be not linked to the availability of nutrients or substrates

It does not predict when cell growth will cease

It predicts that all types of cells under all conditions will grow exponentially

All of the above are correct-Answer

29. In large scale bioreactors, dissolved oxygen levels are often so low that they restrict the rate of cell growth. In this case

Dissolved oxygen would be the growth limiting nutrient

The nitrogen source would be the growth limiting nutrient

The carbon source would be the growth limiting nutrient-Answer

Dissolved oxygen levels would not be the growth limiting nutrient

30. Which of the following is not correct ?

The Monod model is an empirical correlation

The Michaelis Menten model is a mechanistic model

The Monod model was derived from a study of the mechanism of microbial growth-Answer

The Michaelis Menten model was derived from a study of the mechanism of enzyme action

31. The technique of Nick Translation was developed by

Rigby and Paul Berg-Answer

Winkler

Roderick and Rigby

None of them

32. Which technique allows knowing the status in the interphase ?

Hybridization Microarray

Karyotyping

Fluorescence in situ Hybridization-Answer

Pedigree Analysis

33. \_\_\_\_\_ observed that protein sequences undergo variation during evolution according to certain patterns

Zuckerkandl

Pauling

Margaret Dayoff-Answer

All of them

34. Which of the following would have the highest oxygen transfer rate characteristics ?

A sparged stirred tank bioreactor being stirred at 200 rpm

A non-sparged stirred tank bioreactor being stirred at 200 rpm

A shake flask being mixed at 200 rpm

All of the above would have equivalent oxygen transfer rate characteristics

The answer is A sparged stirred tank bioreactor being stirred at 200 rpm

35. Molar heat capacity of water in equilibrium with ice at constant pressure is

Zero

Infinity

40.45 KJ K<sup>-1</sup> mol<sup>-1</sup>

75.48 JK<sup>-1</sup> mol<sup>-1</sup>

The answer is Zero

36. Ammonium molybdate test is used to detect the presence of

Borate

Phosphate

Chloride

Bromide

The answer is Phosphate

37. Increasing the temperature of an aqueous solution will cause

Decrease in Molality

Decrease in Molarity

Decrease in Mole Fraction

Decrease in Percentage by Weight

The answer is Decrease in Molarity

38. IUPAC name of the compound  $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$  is

Lactic Acid

A-Hydroxypropanoic Acid

Carboxy Propanol

2-Hydroxypropanoic acid

The answer is 2-Hydroxypropanoic acid

39 Which of the following will not displace hydrogen ?

Ba

Pb

Ag

Sn

The answer is Ag

40. The amount of heat measure for a reaction in a bomb calorimeter is

DG

DH

DE

PDV

The answer is DE

41. Which of the following oxides is most amphoteric ?

Na<sub>2</sub>O

Al<sub>2</sub>O<sub>3</sub>

SO<sub>3</sub>

P<sub>2</sub>O<sub>5</sub>

The answer is Al<sub>2</sub>O<sub>3</sub>

42. Which among the following is most basic compound ?

Benzylamine

Aniline

Acetanilide

P-Nitroaniline

The answer is Benzylamine

43. Which of the following elements form interstitial compounds ?

Fe

Co

Ni

All of these

The answer is All of these

44 The EAN of Co in  $K_3[Co(NH_3)_6]$  is

34

35

36

37

The answer is 36

45 The position of electron is identified by quantum numbers  $n$  and  $l$ . (i)  $n = 4, l = 1$  (ii)  $n = 4, l = 0$  (iii)  $n = 3, l = 2$  (iv)  $n = 3, l = 1$  The order of increasing energy from the lowest to highest is

(iv) < (ii) < (iii) < (i)

(ii) < (iv) < (i) < (iii)

(i) < (iii) < (ii) < (iv)

(iii) < (i) < (iv) < (ii)

The answer is (iv) < (ii) < (iii) < (i)

46. Gutta Percha is

Trans-polyisopropene

A synthetic polymer

A very hard material

All are correct

The answer is All are correct

47. Which one of following does not give acetylene with water ?

CaC<sub>2</sub>

BaC<sub>2</sub>

SrC<sub>2</sub>



Al4C3

The answer is Al4C3

48. Normality of 0.3 M phosphoric acid ( $H_3PO_3$ ) is

0.3

0.6

0.9

0.1

The answer is 0.6

49. \_\_\_\_\_ technique is based on the fact that there are variations in the DNA sequence of restriction sites among different individuals and different species.

Polymer Chain Reaction

Hybridoma

Restriction Fragment Length Polymorphism

None of these

The answer is Restriction Fragment Length Polymorphism

50 Which enzyme forms phosphodiester bonds between adjacent nucleotides and covalently links two individual fragments of double stranded DNA

Alkaline Phosphates

DNA Polymerase

DNA Liqase

Exonuclease

The answer is DNA Liqase

51 Name the enzyme used to prevent unwanted self-liquation of vector DNA molecules in cleaning procedures

Alkaline Phosphates

DNA Ligase

DNA Polymerase

Helicases

The answer is Alkaline Phosphates

52. Many of the vector for use in eukaryotic cells are constructed such that they can exist in both the eukaryotic cell and E.coli. Such vectors are known as

Shuttle Passengers

Shuttle Vectors

Expression Vectors

All of these

The answer is Shuttle Vectors

53 \_\_\_\_\_ are constructed by combining certain features of plasmid and the cos sites of the phage lambda

Hybrides

Cybrids

Cosmids

None of these

The answer is Cosmids

54 \_\_\_\_\_ are used as vector to clone DNA fragments of more than 1 Mb in size

Yeast Artificial Chromosomes

Bacterial Artificial Chromosomes

Plant Chromosomes

All of these

The answer is Yeast Artificial Chromosomes

55 \_\_\_\_\_ vector can accommodate upto 300-350 kb of foreign DNA

YAC

BAC

Plant

Animal

Answer BAC

56 A collection of clones representing the complete genome of an organism is called

Genomic Library

DNA Library

Inventory

None of these

Answer-Genomic Library

57. Which method is used to introduce recombinant DNA into host cell ?

Electroporation

Microinjection

Biolistics

All of the above-Answer

58. Who invented Polymerase Chain Reaction ?

Ely Lilly

Kary Mullis

Sanger

All of these

The answer is Kary Mullis

59 Who developed Dideoxynucleotide Chain termination method ?

Frederick Sanger and Andrew Coulson

Andrew Coulson and Maxam

Gilbert

All of them

The answer is Frederick Sanger and Andrew Coulson  
60 Who coined the term genomics ?

Winkler

Thomas Roderick

Craig Venter

All of them

The answer is Thomas Roderick

61. \_\_\_\_\_ primarily involves high-throughput DNA sequencing followed by assembly, organization and management of DNA sequence

Structural Genomics

Functional Genomics

Contigs

None of these

The answer is Structural Genomics

62. \_\_\_\_\_ deals with the reconstruction of the genome to determine the biological function of genes and gene interaction

Structural Genomics

Functional Genomics

Random Libraries

Contigs

The answer is Functional Genomics

63 \_\_\_\_\_ of genomic DNA are constructed in small and edium seat plasmid vector along with genomic shotgun large unseat BAC library

Random Arrays

Mirco Arrays

Random Libraries

All of these

The answer is Random Libraries

64. BLAST means

Basic Local Alignment Search Tool

Basic Local Array Search Tool

Basic Linkage Alignment Search Technique

None of them

The answer is Basic Local Alignment Search Tool

65. \_\_\_\_\_ is a closed culture system, which contains limited amount of nutrients

Fed-Batch Culture

Continuous Culture

Batch Culture

All of these

The answer is Batch Culture

66.If a batch culture is continuously or sequentially fed with fresh medium without remaining the growing culture, it is called

Batch Culture

Fed-Batch Culture

Continuous Culture

Another Culture

The answer is Fed-Batch Culture

67 If the temperature of saturated water is increased infinitesimally at constant entropy, the resulting state of water will be

(A) Liquid

- (B) Liquid – vapor coexistence
- (C) Saturated vapor
- (D) Solid

68 Water is flowing under laminar conditions in a pipe of length  $L$ . If the diameter of the pipe is

doubled, for a constant volumetric flow rate, the pressure drop across the pipe

- (A) decreases 2 times
- (B) decreases 16 times
- (C) increases 2 times
- (D) increases 16 times

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