ENTRANCE EXAMINATION, 2016

M.Tech. Bioinformatics

Time: 2 hours   Maximum Marks: 75

HALL TICKET NO.

INSTRUCTIONS

Please read carefully before answering the questions

1. Answers are to be marked on the <u>OMR answer sheet</u> following the instructions provided there upon.

2. Hand over the OMR answer sheet at the end of the examination to the Invigilator.

3. The question paper contains 75 questions of multiple-choice type printed in 13 pages, including this page. OMR answer sheet provided separately.

4. The marks obtained in Part-A will be used for resolving the tie cases.

5. All questions carry one mark each.

6. 0.33 marks will be deducted for every wrong answer.

7. Non-programmable scientific calculators are permitted.

8. Cell/Mobile phones are strictly prohibited in the examination hall.

PART – A

1. Ribozymes are
   a. Non proteinaceous part of an enzyme
   b. Nucleic acids behave as enzymes
   c. Metal-cofactor associated with an enzyme
   d. Secondary structure of protein

2. If $y = ln\ (5\text{-}x)$, then $dy/dx =$
   a. $1 / (5\text{-}x)$
   b. $1 / (x\text{-}5)$
   c. $5 / (5\text{-}x)$
   d. $5 / (x\text{-}5)$

3. What is stderr ?
   a. standard error
   b. standard error types
   c. standard error streams
   d. standard error definitions

4. One of the following NGS methods can cover a full bacterial genome in a single read
   a. Heliscope
   b. PacBio
   c. Solexa
   d. Ion Proton

5. Specify the 2 library functions to dynamically allocate memory?
   a. malloc() and memalloc()
   b. alloc() and memalloc()
   c. malloc() and calloc()
   d. memalloc() and faralloc()

6. Copper is present in
   a. Plasmalemma
   b. Plastoquinone
   c. Cytochrome 'c' oxidase
   d. Ferredoxin

7. Find the value of 12.362 X 0.587 (with appropriate significant figures)
   a. 7.2565
   b. 7.257
   c. 7.26
   d. 7.3

8. Which of the following statements should be used to obtain a remainder after dividing 3.14 by 2.1?
    a. rem = 3.14 % 2.1;
    b. rem = modf(3.14, 2.1);
    c. rem = fmod(3.14, 2.1);
    d. Remainder cannot be obtain in floating point division.

9. Which of the following arrangement of materials in terms of their electrical resistivity is correct?
    a. Quartz > Graphite > Mercury > Copper
    b. Copper > Mercury > Graphite > Quartz
    c. Copper > Mercury > Quartz > Graphite
    d. Mercury >Copper > Graphite > Quartz

10. To determine sequence coverage, one needs to know
    a. Genome size, read length and number of reads
    b. Genomic DNA concentration and number of sequenced clones
    c. Source of DNA, number of repeat regions and G+C content
    d. All of the above

11. Which one of the following vector is perpendicular to $\vec{a} = (-1, -2)$
    a. (2, -1)
    b. (-2, -1)
    c. (1, -2)
    d. (-1, 2)

12. The following algorithm/method has applications in genome assembly
    a. Morkov Chain Monte Carlo
    b. Smith-Waterman
    c. Posterior probability
    d. deBruijn graph

13. A dice is rolled 30 times. What is the mean value for appearance of the numbers *other than 5*?
    a. 6
    b. 20
    c. 25
    d. 30

14. What is the molarity of 10.6% (W/V) sodium carbonate solution?
    a. 100 mM
    b. 1000 mM
    c. 500 mM
    d. 106 mM

15. Identify from the following enzyme which is NOT used in the isolation of the genetic material
    a. Lysozyme
    b. Cellulase
    c. Chitinase
    d. Polymerase

16. Identify number of primary carbon atoms present in
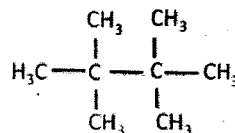
    a. 2
    b. 6
    c. 3
    d. 8

17. Reactivity order of halogen acids with an alkyl group
    a. HCl > HBr > HI
    b. HI > HBr > HCl
    c. HBr > HI > HCl
    d. HCl = HBr > HI

18. How many sigma and pi bonds are present in n1,3-Butadiene
    a. 9 and 1
    b. 9 and 2
    c. 11 and 0
    d. 10 and 0

19. An elevator (lift) weighing 1000kg can carry a weight of 100 kg and it faces the frictional force of 1000 N during its upward movement. What is the power required to move the elevator upwards with a constant velocity of 2 m/s?
    a. 4,200 W
    b. 19,560 W
    c. 21,560 W
    d. 23,560 W

20. Is there any difference between following declarations?
    1 :   extern int fun();
    2 :   int fun();

    a. Both are identical
    b. No difference, except extern int fun(); is probably in another file
    c. int fun(); is overrided with extern int fun();
    d. None of these

21. The following virus can be stained by Gram's staining
    a. Mimivirus
    b. Picorna Virus
    c. Lyssa Virus
    d. Polyoma Virus

22. Which one of the following contains ester bond?
    a. Triglyceride
    b. Glycerol
    c. Glucose
    d. Maltose

23. In general, for the data distribution skewed to the right
    a. mean < median < mode
    b. mean < mode < median
    c. median < mean < mode
    d. mode < median < mean

24. A ds DNA of *E. coli* in which both the strands were labeled with heavy isotope (^{15}N) was transferred in to the medium with ^{14}NH$_4$Cl. This DNA underoes replication per every 20 minutes. After 80 minutes what is the percentage of DNA with ^{14}N and ^{15}N respectively
    a. 50% and 50%
    b. 93.73% and 6.25%
    c. 87.5% and 12.5%
    d. 75% and 25%

25. What kind of hybrid orbitals are utilized by the carbon atom in CF$_4$ molecules?
    a. sp
    b. sp^2
    c. sp^3
    d. sp^{3}d

PART – B

26. How would you round off a value from 1.66 to 2.0?
    a. ceil(1.66)
    b. floor(1.66)
    c. roundup(1.66)
    d. roundto(1.66)

27. Which of the following is a bacterium involved in denitrification?
    a. *Nitrococcus*
    b. *Nitrosomonas*
    c. *Pseudomonas*
    d. *Nitrobacter*

28. Find the matrix X in $\begin{pmatrix} -2 & 3 \\ 3 & -4 \end{pmatrix} X = \begin{pmatrix} 2 & -1 \\ 1 & 3 \end{pmatrix}$

    a. $\begin{pmatrix} 5 & 4 \\ 13 & 9 \end{pmatrix}$

    b. $\begin{pmatrix} 11 & 5 \\ 8 & 3 \end{pmatrix}$

    c. $\begin{pmatrix} -1 & 11 \\ 2 & -15 \end{pmatrix}$

    d. $\begin{pmatrix} -7 & 10 \\ 7 & -9 \end{pmatrix}$

29. $\lim_{x \to 0} \left(\frac{\tan x}{x} \right) =$

    a. 0
    b. 1
    c. -1
    d. ∞

30. An electromagnetic wave which travels with the frequency of 50 Hz has electric field of 7.2 V/m at a certain point in space and time. The magnetic field at the point is,
    a. 2.4×10^{-8} T
    b. 2.16×10^{9} T
    c. 1.08×10^{11} T
    d. 360 T

31. The point dividing a line created by the points (8,9) and (-7,4) in the ratio of 2:3 is
    a. (2, 7)
    b. (-1, 6)
    c. (-7.6, 3.8)
    d. (7.4, 1.2)

32. 3.65 g of HCl is dissolved in 16.2 g of water. Calculate the mole fraction of HCl.
    a. 1
    b. 3.65
    c. 0.1
    d. 4.43

33. A cell increases in size when placed in a n external solution, which is
    a. Hypotonic
    b. Hypertonic
    c. Isotonic
    d. Higher solute concentrated solution

34. Which of the following function is the solution of the equation:
$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 0$$

    a. e^{2x}
    b. e^{-2x}
    c. e^{3x}
    d. e^{-3x}

35. A ball of mass 10g is freely released in vessel containing oil such that the resistive force the ball experience is proportional to its speed. If the time constant is 0.1 s, the terminal speed of the ball will be, (g = 9.8 m/s^2)
    a. 0.98 cm/s
    b. 9.8 cm/s
    c. 98 cm/s
    d. 980 cm/s

36. A genome size of 3.5 Mb signifies which organism?
    a. Yeast
    b. Bacterium
    c. Microfilaria
    d. Virus

37. A 2 m string with the weight of 50g is under the tension of 10 N. The speed of transverse wave on the wire would be
    a. 10 m/s
    b. 16 m/s
    c. 20 m/s
    d. 40 m/s

38. What are the types of linkages?
    a. Internal and External
    b. External, Internal and None
    c. External and None
    d. Internal

39. One of the following questions regarding ecosystem functioning can't be addressed by Metagenomics
    a. Who are there?
    b. What are they doing?
    c. Do they interact?
    d. How long they have been there?

40. Which of the following special symbol allowed in a variable name?
    a. * (asterisk)
    b. | (pipeline)
    c. - (hyphen)
    d. _ (underscore)

41. Is the following statement a declaration or definition?
        extern int i;

    a. Declaration
    b. Definition
    c. Function
    d. Error

42. Which of the following is a natural auxin?
    a. Indole butyric acid
    b. 2,4-Dichlorophenoxy acetic acid
    c. Indole -3- acetic acid
    d. Naphthalene acetic acid

43. The keyword used to transfer control from a function back to the calling function is
    a. switch
    b. goto
    c. go back
    d. return

44. The initiation codon generally present at 5' end of mRNA is
    a. AUC
    b. AUG
    c. GUC
    d. UUU

45. In C, if you pass an array as an argument to a function, what actually gets passed?
    a. Value of elements in array
    b. First element of the array
    c. Base address of the array
    d. Address of the last element of array

46. The bacteria which capture light energy and transform it into chemical energy and obtain carbon from atmospheric carbon dioxide are called
    a. Photoheterotrophs
    b. Photoautotrophs
    c. Chemoheterotrophs
    d. Chemoautotrophs

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L-50

47. What is the percentage of adenine in a DNA molecule of 85A° length having 10 thymine molecules
    a. 10%
    b. 30%
    c. 15%
    d. 20%

48. What will the function rewind() do?
    a. Reposition the file pointer to a character reverse.
    b. Reposition the file pointer stream to end of file.
    c. Reposition the file pointer to begining of that line.
    d. Reposition the file pointer to begining of file.

49. Input/output function prototypes and macros are defined in which header file?
    a. conio.h
    b. stdlib.h
    c. stdio.h
    d. dos.h

50. The point of intersection between the curves $y=x-1$ and $y=x^2-2x-1$ is
    a. (-3, 2)
    b. (3, -2)
    c. (3, 2)
    d. (-3, -2)

51. Which of the following is a tricarboxylic acid?
    a. Malic acid
    b. Oxalo acetic acid
    c. Citric acid
    d. α-ketoglutaric acid

52. A mutation in the trp binding site of the repressor would result in
    a. constitutive trp operon expression
    b. inducible trp operon expression
    c. no operon expression
    d. none of the above

53. Which standard library function will you use to find the last occurance of a character in a string in C?
    a. strnchar()
    b. strchar()
    c. strrchar()
    d. strrchr()

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54. What will the function randomize() do in Turbo C under DOS?
    a. returns a random number.
    b. returns a random number generator in the specified range.
    c. returns a random number generator with a random value based on time.
    d. return a random number with a given seed value.

55. The number of bacteria produced after two hours if a parental bacterium divides by binary fission for every twenty minutes
    a. 8
    b. 16
    c. 32
    d. 64

56. In which stage the following code #include<stdio.h> gets replaced by the contents of the file stdio.h
    a. During editing
    b. During linking
    c. During execution
    d. During preprocessing

57. Which of the following is not a type of signaling molecule?
    a. Testosterone
    b. Insulin
    c. Thyroxin
    d. Adenylate cyclase

58. Which header file should be included to use functions like malloc() and calloc()?
    a. memory.h
    b. stdlib.h
    c. string.h
    d. dos.h

59. Acyl carrier protein (ACP) plays an important role in the biosynthesis of
    a. fatty acids
    b. amino acids
    c. sugars
    d. carbohydrates

60. What function should be used to free the memory allocated by calloc() ?
    a. dealloc();
    b. malloc(variable_name, 0)
    c. free();
    d. memalloc(variable_name, 0)

61. What will happen if in a C program you assign a value to an array element whose subscript exceeds the size of array?
    a. The element will be set to 0.
    b. The compiler would report an error.
    c. The program may crash if some important data gets overwritten.
    d. The array size would appropriately grow.

62. Which of the following is symbolic representation of a monohybrid back cross
    a. Tt x TT
    b. TT x tt
    c. Tt x tt
    d. Tt x Tt

63. How will you free the allocated memory ?
    a. remove(var-name);
    b. free(var-name);
    c. delete(var-name);
    d. dalloc(var-name);

64. The additional OH group of every nucleotide of RNA is bonded to
    a. 3rd carbon position of deoxy ribose sugar
    b. 5th carbon position of deoxy ribose sugar
    c. 2nd carbon position of ribose sugar
    d. 5th carbon position of ribose sugar

65. Which of the following is a keyword in C language?
    a. signed
    b. integer
    c. floater
    d. main ()

66. The hydrolysis of "Lactose" is catalyzed by
    a. permease
    b. transacetylase
    c. beta-galactosidase
    d. primase

67. Which of the following is not a valid relational operator
    a. =>
    b. >=
    c. <=
    d. ==

68. Substitution of which one of the following amino acid with serine during the course of molecular evolution is readily acceptable and is a conservative substitution?
    a. Cysteine
    b. Tryptophan
    c. Proline
    d. Threonine

69. Diamond symbol in Flow chart represents
    a. Process
    b. Decision
    c. Input/output
    d. Termination

70. What is the purpose of fflush() function.
    a. flushes all streams and specified streams.
    b. flushes only specified stream.
    c. flushes input/output buffer.
    d. flushes file buffer.

71. For the better resolution of minute protein bands in SDS-PAGE, which of the following staining method is advised?
    a. CBB Staining
    b. Silver staining
    c. Avidin staining
    d. All of these

.72. Which of the following techniques is used to study the three-dimensional structure of a molecule?
    a. Mass spectrometry
    b. UV-visible spectroscopy
    c. Infra-red spectroscopy
    d. X-ray crystallography

73. How many milliliters of a 200 mM HCl solution are required to bring the pH of 10 milliliters of a 200 mM NaOH solution to 7.0
    a. 4
    b. 40
    c. 10
    d. 20

74. Small cDNA sequence that represents a unique segment of an active gene is called
    a. SNP
    b. SnRNA
    c. EST
    d. Contig

75. Which of the following language is associated with slogan 'write once run anywhere'.
    a. JAVA
    b. C
    c. FORTRAN
    d. COBOL