# VINAYAKA MISSION'S RESEARCH FOUNDATION, SALEM

**(Deemed to be University under section 3 of the UGC Act 1956)**

## Biochemistry

**Instructions:**

1. Answer all the questions.
2. Read each question carefully and write the correct answer for each question chosen by you with black/blue pen in the answer sheet provided.
3. No negative marks for wrong answers.
4. Return the question paper along with the answer sheet.

Time: 90 Minutes Marks: 70

Venue: ----------

**Part B**

[35X1=35]

1. Number of dehydrogenases in TCA cycle
   a) Three
   b) Four
   c) Two
   d) Five
2. Glucokinase is
   a) Ligase
   b) Oxidoreductase
   c) Transferase
   d) Hydrolase
3. First substrate of HMP pathway
   a) Glucose 6-phospahte
   b) Pyruvate
   c) Lactate
   d) oxaloacetate
4. Protein structure is stabilized by ?
   a) Hydrogen bond
   b) Disulfide bond
   c) Hydrophobic bond
   d) All the above

5. Main source of ATP production
    a) Oxidative phosphorylation
    b) Substrate level phosphorylation
    c) Both A & B
    d) None
6. Which of the following is a purine
    a) Uracil
    b) Adenine
    c) Cytosine
    d) Thymine
7. DNA double helix is maintained by
    a) Hydrogen bond
    b) Disulfide bond
    c) Hydrophobic bond
    d) Vanderwaal forces
8. PCR is used for
    a) Amplification of DNA
    b) Synthesis of fatty acids
    c) Ligation of DNA
    d) None
9. Erythropoietin is secreted by
    a) Hypothalamus
    b) Kidney
    c) Golgi complex
    d) Bone marrow
10. Serum cholesterol level is increased in
    a) Hypothyroidism
    b) Hyperthyroidism
    c) Both A&B
    d) None
11. Bile acids are synthesized from
    a) Cholesterol
    b) Glucose
    c) Aminoacids
    d) Nitrogen bases
12. The menstrual cycle is under the control of
    a) FSH
    b) Gastrin
    c) Secretin
    d) Cholecystokinin
13. Biuret test is used for the detection of
    a) Lipids
    b) Carbohydrates
    c) Proteins
    d) Nucleic acids

14. Gene transfer in bacteria occurs through?
    a) Mutation
    b) Translation
    c) Conjugation
    d) Transcription
15. Enzyme required for transcription is
    a) DNA polymerase
    b) RNA polymerase
    c) RNA-ase
    d) Endonuclease
16. Translation means the synthesis of
    a) DNA
    b) Protein
    c) m RNA
    d) rRNA
17. SARS COV-2 is an example of
    a) RNA Virus
    b) DNA Virus
    c) RNA or DNA
    d) Neither RNA nor DNA
18. Epitope
    a) Antigen
    b) Tumour
    c) Antibody
    d) oligonucleotide
19. Insulin resistance is found in
    a) Type 1 diabetes mellitus
    b) Type 2 diabetes mellitus
    c) Diabetes insipidus
    d) All the above
20. Dietary fibre contains
    a) Pectin
    b) Starch
    c) cholesterol
    d) collagen
21. Beri Beri is caused due to the deficiency of
    a) Vitamin B1
    b) Phenyl alanine
    c) Vitamin C
    d) Folic acid
22. The B pelated sheets are found in
    a) Carbohydrates
    b) Protein
    c) Lipids
    d) DNA

23. Western blot is used to detect
    a) Protein
    b) DNA
    c) RNA
    d) Lipids
24. Beat oxidation of fatty acid produces
    a) Acetyl CoA
    b) Succinyl CoA
    c) Propionyl CoA
    d) Malonyl CoA
25. Xeroderma pigmentosum is caused due to abnormalities in?
    a) Vitamin deficiency
    b) Nucleotide excision repair
    c) Protein synthesis
    d) Aminoacid activation
26. Amino acid containing aromatic group
    a) Methionine
    b) Tryptophan
    c) Valine
    d) Asparagine
27. Which of the following are the examples of antigen – antibody interactions?
    a) Precipitation
    b) Agglutination
    c) Complement fixation
    d) All of the above
28. The enzyme used in PCR
    a) Acetyl CoA
    b) Transaminase
    c) TAQ polymerase
    d) DNA Ligase
29. Proteins presents in DNA
    a) Protamines
    b) Histone
    c) Albumins
    d) Non-collagen proteins

30. Y chromosome is
    a) Metacentric
    b) Submetacentric
    c) Acrocentric
    d) Larger than X chromosome

31. DNA synthesis is catalysed by
    a) DNA polymerase
    b) RNA polymerase

c) Ligase
d) Restriction endonuclease

32. Which of the following involved in transamination
a) Coenzyme A
b) Biotin
c) Pyridoxine
d) Folic acid

33. Essential fatty acid
a) Palmitic acid
b) oleic acid
c) Linoleic acid
d) Stearic acid

34. Which of the following is required for fatty acid synthesis?
a) FADH
b) NADPH
c) ATP
d) NADH

35. Which of the following is poly unsaturated fatty acid
a) Lysine
b) oleic acid
c) Linoleic acid
d) All the above

# Chemistry

## Part B

[35X1=35]

1. Which one of the following square planar complex shows geometrical isomerism?
   a) $MA_3B$
   b) $MA_4$
   c) $M(AA')_2$
   d) $M(AA)_2$

2. The reaction, $[RhClL_2] + H_2 \leftrightarrow [RhClL_2(H)_2]$ is called
   a) Insertion
   b) Oxidative addition
   c) Complementary
   d) Reductive elimination

3. EDTA is a _____ ligand.
   a) pentadentate
   b) bidentate
   c) hexadentate
   d) tridentate

4. The number of bridging CO group in $Co_2(CO)_8$ is
   a) 0
   b) 1
   c) 2
   d) 3

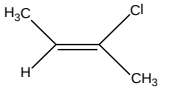
5. Which of the following statement is not correct?
   a) $[FeF_6]^{3-}$ ion is a low spin complex
   b) $\Delta_0 > P$, then the complexes are low-spin
   c) $\Delta_0 < P$, then the complexes are high-spin
   d) d-d transition is responsible for colour of the complex

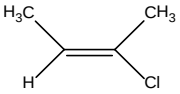
6. In IR spectrum absorption in the 1600 – 1750 $cm^{-1}$ region indicates
   a) C=O
   b) alkane
   c) alkene
   d) cyanide

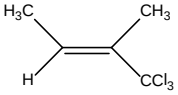
7. The correct order of different types of energies are
   a) $E_{el} >> E_{vib} >> E_{rot} >> E_{tras}$
   b) $E_{el} >> E_{vib} >> E_{tras} >> E_{rot}$
   c) $E_{el} >> E_{rot} >> E_{vib} >> E_{tras}$
   d) $E_{tras} >> E_{el} >> E_{vib} >> E_{rot}$

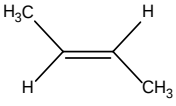
8. Mossbauer and NQR spectra are observed in
   a) liquid state
   b) solid state
   c) gaseous state
   d) liquid crystalline state

9. Which of the following is a Z-isomer?

a) 


b) 


c) 

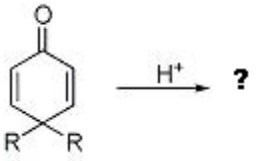

d) 


10. The stereoisomers which are neither superimpossible nor mirror image are called
   a) Meso compound
   b) enantiomers
   c) diastereoisomers
   d) racemic mixture

11. The most stable conformation of ethane is
   a) Boat form
   b) Chair form
   c) Staggered form
   d) Eclipsed form

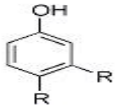
12. Benzene does not undergo addition reaction because
    a) resonance stabilization energy is high
    b) pi electrons of benzene are delocalized
    c) contribution polar resonance hybrids is poor
    d) there is no delocalized double bond

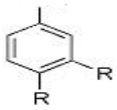
13. What is correct product do you expect in the following reaction?




a) 


b) 


c) 


d) 


14. The wavelength of ultraviolet and visible regions of electromagnetic spectrum is
    a) less than 2000 Å
    b) more than 8000 Å
    c) 2000° to 8000 Å
    d) 2000° to 3000 Å

15. The reactions which are caused by heat and in absence of light are called
    a) photochemical reactions
    b) catalytic reactions
    c) exothermic reactions
    d) thermal or dark reactions

16. Which one of the following excited state have a long life?
    a) $S_1$
    b) $S_2$
    c) $T_1$
    d) $T_2$

17. Which type of electronic transition can be seen in saturated aldehyde and ketones?
    a) $\sigma \rightarrow \sigma^*$
    b) $n \rightarrow \sigma^*$
    c) $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$
    d) $\pi \rightarrow \pi^*$

18. Which is not a terpenoid?
    a) zingiberene
    b) squalene
    c) lanosterol
    d) cholesterol

19. On fusion with conc. KOH quinine gives
    a) quininic acid
    b) 6-hydroxyquinoline
    c) 6-methoxyquinoline + lipidine
    d) meroquinine

20. Pick out the pair of conjugate elements for the $C_{3v}$ point group
    a) $C_3^1$ and $C_3^2$
    b) $C_3^1$ and $\sigma_v^{'}$
    c) $C_3^2$ and $\sigma_v^{''}$
    d) $C_3^1$ and $\sigma_v^{''}$

21. Matrix representation of $\sigma_{xz}$ is
    a) $\begin{pmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
    b) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$
    c) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$
    d) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

22. Mutual exclusion principle is applicable to
    a) HCl
    b) $H_2O$
    c) HBr
    d) $CO_2$
23. Which is used as a standard reference in $^1$H-NMR spectroscopy?
    a) KBr
    b) $CDCl_3$
    c) TMS
    d) DPPH
24. Gibbs phase rule for general system _____
    a) P+F=C-1
    b) P+F=C+1
    c) P+F=C-2
    d) P+F=C+2

25. Specific heat capacity of a substance is equal to _____
    a) mass of the substance × heat capacity
    b) heat capacity/mass of the substance
    c) mass of the substance/heat capacity
    d) mass of the substance + heat capacity

26. Green chemistry reduces the _____ and protects the environment
    a) temperature
    b) water
    c) pollution
    d) air

27. Adenosine is an example of
    a) Nucleotide
    b) Purine base
    c) Nucleoside
    d) Pyrimidine base

28. Insulin belongs to which of the following categories?
    a) A coenzyme
    b) A hormone
    c) An antibiotic
    d) An enzyme

29. The chemical formula of zeolite is
    a) $Na_2Al_2O$
    b) $FeSO_4.7H_2O$
    c) $Al_2(SO_4)_3.18\ H_2O$
    d) $Na_2O.Al_2O_3.xSiO_2.yH_2O$

30. Dimethylglyoxime is used as a coordinating reagent in the quantitative estimation of _____
a) nickel
b) palladium
c) silver
d) copper

31. The general electronic configuration of transition metals is _____.
a) (n-1) $d^{1-10}ns^{1-2}$
b) (n-1) $p^{1-10}ns^{2}$
c) (n-1) $d^{1-10}ns^{1}$
d) (n-1) $d^{1-10}ns^{0}$

32. Chlorophyll is a _____ complex.
a) Manganese-porphyrin
b) Iron-porphyrin
c) Copper-porphyrin
d) Magnesium-porphyrin

33. The chemical composition of talc is _____
a) $Mg_3Si_4O_{10}(OH)_2$
b) $Mg_3Si_3O_{10}(OH)_4$
c) $Mg_3Si_4O_{11}(OH)_2$
d) $Mg_3Si_3O_{10}(OH)_2$

34. The correct order of ionic radii of $Y^{3+}$, $La^{3+}$, $Eu^{3+}$ and $Lu^{3+}$ is _____
a) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$
b) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$
c) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$
d) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

35. The relation between $\Delta G$ and emf of the cell is given by
a) $\Delta G = - nF/E$
b) $\Delta G = nFE$
c) $E = - \Delta G/nF$
d) $E = - nF/\Delta G$

## Computer Science / IT

### Part B

[35X1=35]

1. Which of the following concepts means waiting until runtime to determine which function to call?

A. Data hiding
B. Dynamic casting
C. Dynamic binding
D. Dynamic loading

2. What is correct about the static data member of a class?

A. A static member function can access only static data members of a class.
B. A static data member is shared among all the object of the class.
C. A static data member can be accessed directly from main().
D. Both A and B.

3. If an object is passed by reference, the changes made in the function _____

a) Are reflected to the main object of caller function too
b) Are reflected only in local scope of the called function
c) Are reflected to the copy of the object that is made during pass
d) Are reflected to caller function object and called function object also

4. How to overcome the problem arising due to destruction of temporary object?

a) Overloading insertion operator
b) Overriding functions can be used
c) Overloading parenthesis or returning object
d) Overloading assignment operator and defining copy constructor

5. If a file that needs to be opened is not found in the target location then _____

a) Exception will be produced
b) Exceptions are not produced
c) Exception might get produced because of syntax
d) Exceptions are not produced because of logic

6. What are two exception classes in hierarchy of java exceptions class?

a) Runtime exceptions only
b) Compile time exceptions only
c) Runtime exceptions and other exceptions
d) Other exceptions

7. The subset of a super key is a candidate key under what condition?

a) No proper subset is a super key
b) All subsets are super keys
c) Subset is a super key
d) Each subset is a super key

8. An attribute in a relation is a foreign key if the _____ key from one relation is used as an attribute in that relation.
a) Candidate
b) Primary
c) Super
d) Sub

9. The most commonly used operation in relational algebra for projecting a set of tuple from a relation is
a) Join
b) Projection
c) Select
d) Union

10. An attribute A of datatype varchar(20) has the value "Avi". The attribute B of datatype char(20) has value "Reed". Here attribute A has ____ spaces and attribute B has ____ spaces.

a) 3, 20
b) 20, 4
c) 20, 20
d) 3, 4

11. All aggregate functions except _____ ignore null values in their input collection.
a) Count(attribute)
b) Count(*)
c) Avg
d) Sum

12. Which join refers to join records from the right table that have no matching key in the left table are include in the result set:
a) Left outer join
b) Right outer join
c) Full outer join
d) Half outer join

13. Data integrity constraints are used to:
a) Control who is allowed access to the data
b) Ensure that duplicate records are not entered into the table
c) Improve the quality of data entered for a specific property
d) Prevent users from changing the values stored in the table
14. The attribute name could be structured as an attribute consisting of first name, middle initial, and last name. This type of attribute is called
a) Simple attribute
b) Composite attribute
c) Multivalued attribute
d) Derived attribute

15. An entity set that does not have sufficient attributes to form a primary key is termed a _____

a) Strong entity set
b) Variant set
c) Weak entity set
d) Variable set

16. Which forms has a relation that possesses data about an individual entity:

a) 2NF
b) 3NF
c) 4NF
d) 5NF

17. The RAID level which mirroring is done along with stripping is
a) RAID 1+0
b) RAID 0
c) RAID 2
d) Both RAID 1+0 and RAID 0

18. _____ states that only valid data will be written to the database.

a) Consistency
b) Atomicity
c) Durability
d) Isolation

19. An entity set that does not have sufficient attributes to form a primary key is termed a _____

a) Strong entity set
b) Variant set
c) Weak entity set
d) Variable set

20. Which one of the following is not true?

a) kernel is the program that constitutes the central core of the operating system
b) kernel is the first part of operating system to load into memory during booting
c) kernel is made of various modules which can not be loaded in running operating system
d) kernel remains in the memory during the entire computer session

21. The address of the next instruction to be executed by the current process is provided by the _____

a) CPU registers
b) Program counter
c) Process stack
d) Pipe

22. In a time-sharing operating system, when the time slot given to a process is completed, the process goes from the running state to the _____

a) Blocked state
b) Ready state
c) Suspended state
d) Terminated state

23. Process are classified into different groups in _____

a) shortest job scheduling algorithm
b) round robin scheduling algorithm
c) priority scheduling algorithm
d) multilevel queue scheduling algorithm

24. What is the full form of RMI?
a) Remote Memory Installation
b) Remote Memory Invocation
c) Remote Method Installation
d) Remote Method Invocation

25. What is the main disadvantage of spinlocks?
a) they are not sufficient for many process
b) they require busy waiting
c) they are unreliable sometimes
d) they are too complex for programmers
26. In the bounded buffer problem _____

a) there is only one buffer
b) there are n buffers ( n being greater than one but finite)
c) there are infinite buffers
d) the buffer size is bounded

27. Which one of the following is the deadlock avoidance algorithm?

a) banker's algorithm
b) round-robin algorithm
c) elevator algorithm
d) karn's algorithm

28. The operating system and the other processes are protected from being modified by an already running process because _____

a) they are in different memory spaces
b) they are in different logical addresses
c) they have a protection algorithm
d) every address generated by the CPU is being checked against the relocation and limit registers

29. As disks have relatively low transfer rates and relatively high latency rates, disk schedulers must reduce latency times to _____

a) ensure high bandwidth
b) ensure low bandwidth
c) make sure data is transferred
d) reduce data transfer speeds

30. Communication between the browser and Web server takes place via
A. GUI
B. HTTP
C. ASP
D. JSP

31. Client and the Web server have a connection of type
A. Continuous
B. Dependent
C. Permanent
D. Not Continuous

32. In the layer hierarchy as the data packet moves from the upper to the lower layers, headers are _____
a) Added
b) Removed
c) Rearranged
d) Modified

33. Which layer is used to link the network support layers and user support layers?
a) session layer
b) data link layer
c) transport layer
d) network layer

34. TCP process may not write and read data at the same speed. So we need _____ for storage.
a) Packets
b) Buffers
c) Segments
d) Stacks

35. Which of the following is not correct in relation to multi-destination routing?
a) is same as broadcast routing
b) contains the list of all destinations
c) data is not sent by packets
d) there are multiple receivers

# English

**Part B**

[35X1=35]

1. Rape of the Lock (1712) by A. Pope contains _____ cantos
   a. Three
   b. Five
   c. Six
   d. Four.
2. The Heroic Couplet was first used by
   a. Shakespeare
   b. A. Pope
   c. Chaucer
   d. Dryden.
3. In which century the 'Coffee House' culture flourished in England
   a. Early 18th century
   b. Latter 18th century
   c. Mid-18th century
   d. Latter 17th century.

4. 'Poetry is more philosophical and higher than history' said by _____
   a. I.A. Richards
   b. P. Sidney
   c. Aristotle
   d. T.S. Eliot.
5. Identify the wrong pair
   a. Imagined Communities – Stanley Fish
   b. Cognitive Mapping –Frederick Jameson
   c. Differend – Jean Lyotard
   d. Ubermensch – F. Nietzsche.
6. "Waiting for Visa" is a 20 page autobiographical story of _____
   a. J. Nehru
   b. M.K. Gandhi
   c. B.R. Ambedkar
   d. Sarojini Naidu

7. 'A Doll for the Child Prostitute' is a short story that tells the emotional and pitiable story of Rukmani, a minor girl of thirteen years who faces the scourge of society when she is raped by her father and sold for prostitution. It was written by _____
   a. Bama
   b. P. Sivakami
   c. Urmila Pawar
   d. Kamala Suraiyya

8. In "Whispers of Immortality," T.S. Eliot says that a dramatist 'was much possessed by death/ and saw the skull beneath the skin' and a poet 'knew the anguish of the marrow/ the argue of the skeleton.' Who are the dramatist and poet he is referring to?
   a. Jonson and John Donne
   b. Webster and Arnold
   c. Jonson and Arnold
   d. Webster and John Donne.
9. W. Thackeray's "Vanity Fair: A Novel without a hero" takes its title from _____
a. The Unfortunate Traveler
b. The Pilgrim's Progress
c. Paradise Lost
d. Don Quixote

10. 'He was not of an age, but for all time' Ben Jonson makes this comment on _____
a. Chaucer
b. Sidney
c. Marlowe
d. Shakespeare

11. Identify the incorrect pair
a. Phonology – sound system
b. Morphology – ordering of speech sounds
c. Semiology – speech system
d. Etymology – evolution of words.

12. Magna Carta was signed in the year
a. 1215
b. 1315
c. 1415
d. 1515.
e.
13. Match the characters

| List – I (works) | List – II (Characters) |
|---|---|
| a. The Old Curiosity Shop | Estella |
| b. Hard Times | Nancy |
| c. Great Expectation | Little Nell |
| d. Oliver twist | Sissy Jupe. |

(A) (B) (C) (D)

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

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

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

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

14. Tottel's Miscellany published in the year _____
    a. 1555
    b. 1557
    c. 1558
    d. 1554.

15. The subtitle for Coleridge's poem Kubla Khan was _____
a. A dream in a vision
b. A dream in a real
c. A vision in a dream
d. A vision in a real.

16. Who is regarded as the father of American Poetry
a. R.W. Emerson
b. William Cullen Bryant
c. Wallace Stevens
d. Walt Whitman.

17. The name of the Host in the 'Prologue to The Canterbury Tales' by Chaucer is
a. Harry Bailly
b. Thomas Beckett
c. Sir Topas
d. Huberd.

18. Samuel Pepys and John Evelyn wrote
a. Novels
b. Diaries

c. Biographies
d. Plays.

19. Arundhati Roy has recently been awarded for the Booker's Prize for her novel
a. The Apes of God
b. The Nude Before God
c. The God of Small Things
d. The God the Failed.

20. Who is known as the 'Nun of Amherst?'
a. Sylvia Plath
b. Emily Dickinson
c. Adrienne Rich
d. Anne Sexton.

21. What was Milton's purpose in writing 'Paradise Lost?'
a. Preaching a moral lesson
b. Satirizing society
c. Telling a story
d. Justifying the ways of God to Man.

22. In which country is the story of 'Othello' set?
a. Venice
b. England
c. Denmark
d. Greece.

23. The English Reformation was a series of events in the 16$^{th}$ century England by which the Church of England broke away from the authority of _____
a. King and the Roman Catholic Church
b. King Martin Luther and the Roman Catholic Church
c. Pope and the Roman Catholic Church
d. All the above.

24. The hero of this mock-epic is Lewis Theobald. The poet describes him as reclining on the lap of his mother, beneath whose throne "Science groans in chains/ And Wit dreads exile, penalties, and pains."
a. Dryden's "Absalom and Achitophel"
b. Pope's "The Dunciad"
c. Dryden's "Mac Flecknoe"
d. Pope's "The Rape of the Lock."

25. According to John Milton's "Paradise Lost," what is Satan's tragic flaw?
a. Pride
b. Jealousy
c. Love
d. Lust.

26. Words from which language began to enter English vocabulary around the time of the Norman Conquest in 1066?
a. Spanish
b. Norwegian
c. Danish
d. French

27. Which King was executed in the year 1649?
a. Charles II
b. Charles I
c. James II
d. James I

28. In the poem To His Coy Mistress, Marvell refers to two rivers. Name them
a. Yamuna and Humber
b. Ganges and Thames
c. Ganges and Humber
d. Yamuna and Thames.

29. Seven is an archetype associated with
a. Evil
b. Birth
c. Death
d. Perfection.

30. The liberating and subversive influence of popular humor on the literary tradition, the mingling of sacred with the profane, the sublime with the ridiculous, that lies behind the most open literary genres. What does this refer to?
a. Heteroglossia
b. Carnivalesque
c. Chronotype
d. Polyphony

31. The Flamethrowers (2013) Telex from Cuba (2008) and Cuba (2018) are written by
a. Rachel Kushner
b. Cormac McCarthy
c. Don DeLillo
d. William Kennedy

32. John Fiske is an important name in _____
a. Disability Studies
b. Body studies
c. Ecological studies
d. Television studies

33. Which of the following poets was heavily influenced by Edmund Spencer in his early career?
a. Milton
b. Dryden
c. Keats
d. Wordsworth

34. In Scarlet Letter, in what clothes is Pearl always dressed, which symbolizes shame?
a. Grey
b. Red
c. Mud Brown
d. Black

35. Which of the following is not true about Beowulf?
a. It begins in *media res*
b. It has 3182 lines
c. Beowulf is written in the West Saxon dialect
d. Beowulf has survived in the Junius manuscript

# Mathematics

## Part B

[35X1=35]

1. The compound propositions p and q are called logically equivalent if _____ is a tautology.
   (a) $p \leftrightarrow q$
   (b) $p \rightarrow q$
   (c) $q \rightarrow p$
   (d) $q \leftrightarrow p$

2. For any natural number n, $7^n - 2^n$ is divisible by
   (a) 3
   (b) 4
   (c) 5
   (d) 7

3. The last column of the truth table for the statement $\neg p \vee q$ is
   (a) T, T, T, T
   (b) T, F, T, T
   (c) F, T, T, F
   (d) F, T, F, F

4. The solution to the recurrence relation $a_n = 5a_{n-1} + 6a_{n-2}$ is
   (a) $a_n = A6^n + B(-1)^n$
   (b) $a_n = A(-6)^n + B(-1)^n$
   (c) $a_n = A(-6)^n + B\,(1)^n$
   (d) $a_n = A6^n + B(1)^n$

5. Two graphs are isomorphic if
   (a) both has same number of nodes
   (b) both has same number of edges
   (c) both has same number of nodes & same number of edges
   (d) both has same number of nodes , same number of edges , have same degree sequence &preserves adjacency

6. G is an undirected graph with n vertices and 26 edges such that each vertex of G has a degree at least 4. Then the maximum possible value of n is
   (a) 7
   (b) 43
   (c) 13
   (d) 10

7. A relation R in a set A in which for every x, y ∈ A, if xRy then yRx R is called
   (a) Reflexive
   (b) Symmetric
   (c) Transitive
   (d) Commutative

8. If the binary operation * is defined on a set of ordered pairs of real numbers as $(a,b) * (c,d) = (ad + bc, bd)$ and is associative, then $(1,2) * (3,5) * (3,4)$ equals
   (a) (74,40)
   (b) (11,40)
   (c) (11,10)
   (d) (27,20)

9. In a lattice ($S_{42}$ , D) the complement of 3 is
   (a) 14
   (b) 7
   (c) 3
   (d) 21

10. Two perfect dice are thrown simultaneously. If X is face number on first die and Y that on second die, which of the following is zero?
    (a) $P(X = 1, Y = 1)$
    (b) $P(X = 2, Y > 1)$
    (c) $P(X + Y = 1)$
    (d) $P(X = Y)$

11. Let X and Y be two random variables. Then for $f(x, y) = c$, $0 < x < 1, 0 < y < 2$ to be a joint density function, $c$ must be equal to
    (a) 1
    (b) 2
    (c) ½
    (d) ¼

12. The Euler's Phi-function is
    (a) Non Multiplicative
    (b) Multiplicative
    (c) Injective
    (d) Surjective

13. If $S_{XX}(\omega) = 5$ and $H(\omega) = \frac{1}{5+i\omega}$ then $S_{YY}(\omega) =$
    (a) $\frac{1}{2+\omega^2}$
    (b) $\frac{3}{36+\omega^2}$
    (c) $\frac{1}{36+\omega^2}$
    (d) $\frac{5}{25+\omega^2}$

14. The value of $R_{XX}(t, t+\tau)$ is
    (a) E[ X(t) X( t + x)]
    (b) E[ X(t) X( t+$\tau$)]
    (c) E[ X(t) X( t+$\tau x$)]
    (d) E[ X(t)] E[ X( t + x)]

15. The p.d.e by eliminating the arbitrary constants a & b from $z = ax + by$ is

(a) $z = px + qy$

(b) $z = pq$

(c) $z = pxqy$

(d) $z = pq + 1$

16. A Commutative ring $(R, +, .)$ with identity in which every non-zero element has multiplicative inverse is a

(a) Group

(b) Field

(c) Subgroup

(d) Subring

17. A subgroup $(H, *)\ of\ (G, *)$ is called a normal subgroup of G if

(a) $aH = Ha, \forall\ a \in G$

(b) $aH \neq Ha, \forall\ a \in G$

(c) $aH < Ha, \forall\ a \in G$

(d) $aH > Ha, \forall\ a \in G$

18. The Z- transform of $n2^n$ is

(a) $F(z) = \frac{-1}{(z-1)^2}$

(b) $F(z) = \frac{z}{(z-1)^2}$

(c) $F(z) = \frac{2z}{(z-2)^2}$

(d) $F(z) = \frac{1}{(z-a)^2}$

19. The Taylor's expantion of $f(x) = e^x$ about $x = 0$

(a) $f(x) = 1 + \frac{x}{1!} + \frac{x^2}{2!} + \cdots$

(b) $f(x) = x + \frac{x}{2} + \frac{x^3}{3} + \cdots$

(c) $f(x) = 1 - \frac{x^3}{3} + \frac{x^5}{5} - \cdots$

(d) $f(x) = 1 + \frac{x^3}{3} + \frac{x^5}{5} + \cdots$

20. The critical point of given $f(x) = x - 2\sin x, 0 \leq x \leq 2\pi$ is

(a) 0,1

(b) $2\pi$

(c) $\frac{\pi}{3}, \frac{5\pi}{3}$

(d) $\frac{\pi}{2}, \frac{\pi}{3}$

21. The Ode with constant coefficient for $[x^2D^2 + 2xD + 1]y = x^2$

(a) $(\theta^2 + \theta + 1)y = e^{2z}$

(b) $(\theta^2 + 2\theta + 1)y = x^2$

(c) $(\theta^2 - 2\theta + 1)y = z^2$

(d) $(\theta^2 - 2\theta + 1)y = e^{2z}$

22. Which value of $x$, the function$f(x) = 2x^3 - 15x^2 + 36x$ is decreasing

(a) (0,2)

(b) (2,3)

(c) $(-\infty, 2)$

(d) (3,6)

23. Let F be a field, $a \in F$ *and* $f(x) \in F(x)$. Then $'a'$ *i*s the a root of $f(x)$ if and only if $(x - a)$ is a factor of $f(x)$. This theorem is

(a) Residue Theorem

(b) Convolution Theorem

(c) Cauchy's Theorem

(d) Factor Theorem

24. The decimal equivalent of binary 1010000 is

(a) 9610

(b) 8010

(c) 7810

(d) 8410

25. If $a \equiv b\ (modn)$, then

(a) a and b leave the same non negative remainder when divided by n

(b) a and b leave the different nonnegative remainder when divided by n

(c) a and b need not leave the same nonnegative remainder when divided by n

(d) a and b leave the same nonnegative remainder when divided by n-1

26. The Regression equations of (X, Y) are $3x + y = 26, 6x + y = 29$, then the mean of X is

(a) $\bar{X} = 2$

(b) $\bar{X} = 3$

(c) $\bar{X} = 6$

(d) $\bar{X} = 1$

27. If f(z) = u(x,y)+iv(x,y) is an analytic function then u and v satisfy

(a) $u_x = v_y and\ u_y = -v_x$

(b) $u_x = v_y and u_y = v_x$

(c) $u_x = v_x and u_y = -v_y$

(d) $u_x = -v_y and u_y = v_x$

28. If A is a matrix of order m x n and B is a matrix of order n x p then order of AB is

(a) p x m

(b) m x p

(c) p x n

(d) n x p

29. If P(x) = 0.5 and x = 4, then E(x) =

(a) 1

(b) 0.5

(c) 4

(d) 2

30. If $p$ is a prime, then
    (a) $(p-1)! \equiv 1 \ (mod\ p)$
    (b) $(p-1)! \equiv -1 \ (mod\ p)$
    (c) $(p-1)! \equiv 0 \ (mod\ p)$
    (d) $(p-1)! \equiv \pm 1 \ (mod\ p)$

31. The random process X(t) takes the value -1 with probability $\frac{1}{3}$ and takes the value 1 with probability $\frac{2}{3}$, then Mean is
    (a) Mean = $\frac{1}{3}$
    (b) Mean = 0
    (c) Mean = 1
    (d) Mean = 2/3

32. If $f(x,y) = \begin{cases} 2, & 0 < x, y < 1 \\ 0, & otherwise \end{cases}$ then the marginal density function of $y$is
    (a) $f(y) = 2 \ , 0 < x < y$
    (b) $f(y) = 2y \ , 0 < y < 1$
    (c) $f(y) = 2x \ , 0 < x < y$
    (d) $f(y) = 2 \ , 0 < y < 1$

33. If the joint probability distribution of X and Y is given by p (x ,y) = k(x +y), x=1,2,3 and y= 1,2 then the value of k is
    (a) 1/21
    (b) 2/21
    (c) 3/21
    (d) 4/21

34. Let x , y are ordered pairs, then the inner product $\langle cx,\ y \rangle$ is

(a) $\langle cx,\ y \rangle = c\langle x, y \rangle$

(b) $\langle cx,\ y \rangle = \langle x, cy \rangle$

(c) $\langle cx,\ y \rangle = \langle x, y \rangle + c$

(d) $\langle cx,\ y \rangle = \langle cx, + y \rangle$

35. A transformation that preserves angels between every pair of curves through a point , both in magnitude and sense is called

(a) Isogonal mapping

(b) Conformal mapping

(c) Bilinear mapping

(d) Inversion mapping