

Biotechnology Engineering(Ph.D.)

1. The most active stage in the sigmoid curve of bacteria that attains maximum growth is
 (A) Lag (B) Stationary (C) Decline (D) Log
2. The spores of the bacteria which can withstand moist heat effect also
 (A) *Bacillus subtilis* (B) *Coxiella burnetti*
 (C) *Bacillus stearothermophilus* (D) *Pseudomonas*
3. Which of the following method refers to estimation of volumetric mass-transfer coefficient (k_{La}) where changes in dissolved oxygen tension are measured using an oxygen electrode after a step change in aeration condition in the fermenter. The results are interpreted as unsteady-state material balance equations to obtain k_{La} value.
 (A) Dynamic gassing out (B) Static gassing out
 (C) Sulphite oxidation (D) Oxygen balance
4. Identify the correct sequence of typical unit-operations during downstream processing so as to achieve increasing product quality
 (A) extraction, filtration, chromatography, crystallization
 (B) filtration, extraction, chromatography, crystallization
 (C) crystallization, extraction, filtration, chromatography
 (D) filtration, extraction, crystallization, chromatography
5. Which of the following is not valid for a chemostat operation?
 (A) Nutrient -limited (B) Self-balancing
 (C) Steady-state (D) Operates at μ_{max}
6. If the apparent viscosity of the liquid decreases with increase in shear rate, its rheology matches with
 (A) Bingham plastics (B) Pseudoplastics
 (C) Dilatant (D) Newtonian
7. A batch fermenter analysis used for the production of yeast cells from glucose reports the doubling time of cells as 2.5 h. What is the average specific growth of cells?
 (A) 0.462 h^{-1} (B) 0.277 h^{-1} (C) 3.60 h^{-1} (D) 1.73 h^{-1}
8. Baffles are provided in bioreactors to
 (A) Remove dirt (B) Increase heat transfer rate
 (C) To provide better mechanical strength (D) To prevent vortex formation
9. In order to design an ideal filtration system for performing the sterilization of animal cell culture medium, find the correct match between Absolute rating and desired removal

1. 5 μm	a. Mycoplasma removal
2. 0.5 μm	b. Endotoxin removal
3. Single layered 0.1 μm	c. Coarse precipitate removal
4. Double layered 0.1 μm	d. Bulk microbial load removal

 (A) 1-a,2-b,3-c,4-d (B) 1-c,2-d,3-b,4-a (C) 1-b,2-d,3-c,4-a (D) 1-a,2-c,3-b,4-d
10. How many V, J, D gene segments do humans have
 (A) 48, 5, 27 (B) 50, 6, 27 (C) 48, 27, 5 (D) 50, 30, 6

11. If $LK < LK_0$, then DNA is
- (A) $\Delta LK > 0$ (B) Relaxed
(C) Negatively supercoiled (D) Positively supercoiled
12. Enzyme causing polymerization during nick translation is
- (A) RNA polymerase (B) DNA polymerase I
(C) DNA polymerase II (D) Polymerase III
13. Protein gives absorbance at 280 nm because of the amino acid
- (A) Asparagine and glutamine (B) Threonine and valine
(C) Tryptophan and Tyrosine (D) Proline and threonine
14. Trypsinogen is processed into trypsin by
- (A) Addition of isoprenyl group (B) Formation of disulfide linkage
(C) Addition of carbohydrate side chain (D) Proteolytic cleavage
15. A Batch reactor is suitable for
- (A) Large scale gas phase reactions
(B) Achieving 100% conversion of the reactants into products
(C) Obtaining uniform polymerization products in highly exothermic reactions
(D) Liquid phase reactions
16. 1000 liter bioreactor contains 10 g / L of growing cells with $q_{O_2} = 15$ mmoles O_2 / (g cells hr) $D_T = 2$ m, $D_i = 1$ m, (6 – blade turbine agitator) x 3 blades and $C_L = 1$ mg O_2 /L. Determine the OUR (mmoles of O_2 /g cells per hr) of the process.
- (A) 200 (B) 250 (C) 1500 (D) 150
17. According to Monod's equation, find the correct definition for k_s .
- (A) Initial substrate concentration
(B) Yield coefficient
(C) Maximum specific growth rate
(D) Substrate concentration when growth rate equals half of the maximum growth rate
18. 2 litre/sec of gaseous reactant A is introduced into a packed bed reactor of volume 10 litres. The space time for the reactor is
- (A) 0.2 sec (B) 20 sec (C) 5 sec (D) 2 sec
19. Most suitable reactor configuration for an autocatalytic reaction is
- (A) Plug flow (B) CSTR (C) Recycle reactor (D) CSTRs in series
20. For a zero order reaction, the concentration of product increases with
- (A) Increase in the initial concentration (B) Increase in the reaction time
(C) Decrease in the total pressure (D) Total pressure
21. Which type of bioreactor configuration demands aeration to be performed in a separate vessel?
- (A) Stirred reactors (B) Fluidized bed reactors
(C) Packed bed reactors (D) Trickle bed reactors

22. Identify which of the following is not the true characteristic of an agitated fermenter?
(A) Increased surface area available for oxygen transfer
(B) Escape of air bubbles from liquid is enhanced
(C) Coalescence of air bubbles is prevented
(D) Decreased liquid film thickness at gas-liquid interface in the culture fluid
23. Deviations from the ideal plug flow pattern are referred as
(A) Linear dispersion (B) Axial dispersion
(C) Circular dispersion (D) Non-dispersion
24. Select the recommended value for the oxygen concentration in aerobic fermentations
(A) Just equal to critical concentration (B) Less than critical concentration
(C) More than critical concentration (D) Varies from process to process
25. For an ideal CSTF operation, which of the following is assumed as negligible?
(A) Disappearance of reactant (B) Inflow
(C) Outflow (D) Accumulation
26. What are the key elements of a dissertation?
(A) Research Plan; Research Data; Analysis; References
(B) Introduction; Literature Review; Research Methodology; Results; Discussions and Conclusions
(C) Executive Summary; Literature Review; Data Gathered; Conclusions; Bibliography
(D) Introduction; Data Collection; Data Analysis; Conclusions and Recommendations
27. The most comprehensive source of population data is _____
(A) National Sample Surveys (B) Demographic Health Surveys
(C) Census (D) National Family Health Surveys
28. Under what conditions a research problem is not feasible
(A) It is new and adds something to knowledge
(B) It contains dependent and independent variables
(C) It can be researched
(D) It has utility and relevance
29. What is the major characteristic of Correlation Analysis?
(A) Difference among variables (B) Regression among variables
(C) Variations among variables (D) Association among variables
30. Which of the following is the most essential in order to pursue the research?
(A) Formulating a research question
(B) Developing a research design
(C) Deciding about the data analysis procedure
(D) Formulating a research hypothesis
31. Identify the correct statement among the following statement in the context to the testing of hypotheses
(A) It is only the alternative hypotheses that can be tested.
(B) Both the alternative and the null hypotheses can be tested.
(C) Both the alternative and the null hypotheses cannot be tested.
(D) It is only the null hypotheses that can be tested.

32. The main purpose of the scientific method in the research field is to _____
 (A) Introduce new variables (B) Confirm triangulation
 (C) Improve data interpretation (D) Eliminate spurious relations
33. Which of the following concisely demonstrate what we are trying to achieve through the research?
 (A) Research title (B) Research duration
 (C) Research objectives (D) Total expenditure on research
34. Which one is called non-probability sampling?
 (A) Quota sampling (B) Systematic sampling
 (C) Stratified random sampling (D) Cluster sampling
35. What do you mean by an assumption?
 (A) It is a framework in which research work has to be done
 (B) It simplifies the logical process of arriving at the solution
 (C) It is a restrictive condition
 (D) A sample who does not receive the experimental treatment
36. In order to establish the relationship of family size to income, a student classifies the population into different income slabs with a subsequent random sample selection from each slab. Which technique of sampling does he refer?
 (A) Cluster sampling (B) Random sampling
 (C) Stratified random sampling (D) Systematic sampling
37. For the population with finite size which of the following sampling method is generally adopted?
 (A) Cluster sampling (B) Area sampling
 (C) Purposive sampling (D) Systematic sampling
38. Survey research studies are based on _____
 (A) Events (B) Populations (C) Processes (D) Circumstances
39. The main objective of using statistical techniques in any research problem is to confirm
 (A) Whether worthwhile inferences could be drawn
 (B) Whether appropriate statistical techniques are available
 (C) Whether analysis of data would be possible
 (D) Whether the data could be quantified
40. A researcher prepared a calibration curve by measuring the absorbance of 5 standard solutions of a compound at 410 nm. A cuvette with a path length of 2 cm was used. If the slope of the curve was 100 L/mol the molar absorptivity of the compound is ____
 (A) 82 L mol⁻¹ cm⁻¹ (B) 50 L mol⁻¹ cm⁻¹
 (C) 200 L mol⁻¹ cm⁻¹ (D) 1000 L mol⁻¹ cm⁻¹
41. In an electron microscope the objective lens is made of
 (A) Glass (B) Quartz (C) Magnetic coils (D) Electrons
42. The portion of the fermenter left without the broth is called as _____
 (A) Sparger (B) Impeller (C) Headspace (D) Shaft

43. Unstimulated state G-proteins are
 (A) Associated with GTP
 (B) Associated with GDP
 (C) Broken up into two active components, an α subunit and a $\beta\gamma$ complex
 (D) Associated with adenylyl cyclase
44. All are true about HLA except
 (A) Name of MHC in human
 (B) Proteins
 (C) Same species may have different allele of MHC genes
 (D) Present on almost all cell types
45. Efficacy of a new drug molecule can be tested in which of the following phases of a clinical trial?
 (A) Phase-1 (B) Phase-2 (C) Phase-3 (D) Phase-4
46. HLA-DR, -DP, and -DQ gene region code for which MHC type
 (A) α chain of MHC-I (B) α and β chain of MHC-II
 (C) MHC-III (D) β chain of MHC-I
47. In case of mitochondrial genetic code, UGA is a _____ codon.
 (A) Tryptophan (B) Arginine (C) Proline (D) Stop codon
48. Among second generation sequencing method, the correct sequence of enzymes used in first three steps of pyrosequencing are
 (A) DNA polymerase, ATP sulfurylase, luciferase and apyrase
 (B) ATP sulfurylase, DNA polymerase, luciferase, and apyrase
 (C) DNA polymerase, luciferase, ATP sulfurylase and apyrase
 (D) DNA polymerase, apyrase, ATP sulfurylase, and luciferase
49. How does the apparent viscosity of Non-Newtonian fluids behave?
 (A) Constant (B) Dynamic
 (C) Varies with the shear stress (D) Varies with the shear rate
50. For a gas-phase reaction $4R \rightarrow 7S$, if the feed contains two-third part of the reactant and one-third part of the inert, calculate its fractional change in the volume.
 (A) 0.75 (B) 1.0 (C) 0.5 (D) 0

Chemical Engineering(Ph.D)

1. Which ONE of the following sequences is arranged according to increasing calorific value?
(A) Producer gas, Natural gas, Water gas (B) Natural gas, Producer gas, Water gas
(C) Producer gas, Water gas, Natural gas (D) Water gas, Natural gas, Producer gas
2. Hydro treating is used for
(A) removal of water from crude oil
(B) treatment of crude oil with water
(C) improving octane number of gasoline
(D) removal of sulphur and nitrogen from petroleum fraction
3. Zeolite ZSM-5 is added to commercial FCC catalyst for
(A) promoting SO₂ reduction
(B) promoting CO oxidation
(C) improving tolerance to metal content in feed
(D) enhancing Octane number
4. Minimum input required to calculate the 'blank diameter' for a torispherical head is
(A) crown radius
(B) crown radius, knuckle radius and length of straight flange
(C) knuckle radius and length of straight flange
(D) crown radius and knuckle radius
5. In film type condensation over a vertical tube, local heat transfer coefficient is
(A) inversely proportional to local film thickness
(B) directly proportional to local film thickness
(C) equal to local film thickness
(D) independent of local film thickness
6. The CORRECT sequence of process equipment used in the production of sulphuric acid from sulphur by contact process is
(A) burner, catalytic converter, 98% sulphuric acid absorption tower, oleum absorption column
(B) catalytic converter, oleum absorption column, 98% sulphuric acid absorption tower, burner
(C) burner, catalytic converter, oleum absorption column, 98% sulphuric acid absorption tower
(D) burner, oleum absorption column, catalytic converter, 98% sulphuric acid absorption tower
7. If the temperature of saturated water is increased infinitesimally at constant entropy, the resulting state of water will be
(A) Liquid (B) Liquid-vapour co-existence
(C) Saturated vapour (D) Solid
8. 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

9. The local velocity of a fluid along a streamline can be measured by
 (A) Pitot tube (B) Venturi meter
 (C) Rotameter (D) Orifice meter
10. For heat transfer across a solid fluid interface, which one of the following statements is NOT true when the Biot number is very small compared to 1?
 (A) Condition resistance in the solid is very small compared to convection resistance in the fluid
 (B) Temperature profile within the solid is nearly uniform
 (C) Temperature drop in the fluid is significant
 (D) Temperature drop in the solid is significant
11. In the McCabe-Thiele diagram, if the x-coordinate of the point of intersection of the q-line and the vapour-liquid equilibrium curve is greater than the x coordinate of the feed point, then the quality of the feed is
 (A) Superheated vapour (B) Liquid below bubble point
 (C) Saturated vapour (D) Saturated liquid
12. The half-life of a n^{th} order reaction in a batch reactor depends on
 (A) Only the rate constant
 (B) Only the rate constant and the order of the reaction
 (C) Only the rate constant and initial reactant concentration
 (D) The rate constant, initial reactant concentration and the order of the reaction
13. In petroleum refining catalytic reforming is used to convert
 (A) Paraffins and Naphthenes to aromatic
 (B) Paraffins to hydrogen and carbon monoxide
 (C) Gas oil to diesel and gasoline
 (D) Light olefins to gasoline
14. The Bode stability criterion is applicable when
 (A) Gain and phase curves decrease continuously with frequency
 (B) Gain curve increases and phase curve decreases with frequency
 (C) Gain curve and phase curve both increase with frequency
 (D) Gain curve decreases and phase curve increases with frequency
15. In the Tyler standard screen scale series, when the mesh number increases from 3 mesh to 10 mesh, then
 (A) the clear opening decreases (B) the clear opening increases
 (C) the clear opening is unchanged (D) the wire diameter increases
16. In a pool boiling experiment, the following phenomena were observed.
 P. Natural convection
 Q. Film boiling
 R. Transition boiling
 S. Nucleate boiling
 What was the CORRECT sequence of their occurrence?
 (A) P, Q, R, S (B) S, R, Q, P (C) Q, R, P, S (D) P, S, R, Q

17. The packing of an existing absorption tower is replaced with a new type of packing. The height of the packing and the inlet conditions are maintained the same as before. Tests reveal that the number of transfer units is lower than before. This indicates that the tower with the new packing, when compared to that with the old packing, will
- (A) have a higher rate of absorption of the solute from the gas stream
 - (B) have a lower rate of absorption of the solute from the gas stream
 - (C) have the same rate of absorption of the solute from the gas stream
 - (D) have a lower height of transfer unit
18. A wet solid is dried over a long period of time by unsaturated air of nonzero constant relative humidity. The moisture content eventually attained by the solid is termed as the
- (A) unbound moisture content
 - (B) bound moisture content
 - (C) free moisture content
 - (D) equilibrium moisture content
19. In the manufacture of sulphuric acid by the contact process, the catalytic oxidation of SO_2 is carried out in multiple stages mainly to
- (A) increase the reaction rate by providing inter-stage heating
 - (B) increase the overall conversion by providing inter-stage heating
 - (C) increase the overall conversion by providing inter-stage cooling
 - (D) decrease the overall conversion by removing sulphur trioxide between stages
20. In the elutriation leg of a commercial crystallizer containing a mixture of coarse and very fine crystals of the same material, a liquid is pumped vertically upward. The liquid velocity is adjusted such that it is slightly lower than the terminal velocity of the coarse crystals only. Hence
- (A) the very fine and coarse crystals will both be carried upward by the liquid
 - (B) the very fine and coarse crystals will both settle at the bottom of the tube
 - (C) the very fine crystals will be carried upward and the coarse crystals will settle
 - (D) the coarse crystals will be carried upward and the very fine crystals will settle
21. In order to achieve the same conversion under identical reaction conditions and feed flow rate for a non-autocatalytic reaction of positive order, the volume of an ideal CSTR is
- (A) always greater than that of an ideal PFR
 - (B) always smaller than that of an ideal PFR
 - (C) same as that of an ideal PFR
 - (D) smaller than that of an ideal PFR only for first order reaction
22. Packed towers are preferred for gas-liquid mass transfer operations with foaming liquids because
- (A) in packed towers, high liquid to gas ratios are best handled
 - (B) in packed towers, continuous contact of gas and liquid takes place
 - (C) packed towers are packed with random packings
 - (D) in packed towers, the gas is not bubbled through the liquid pool
23. In order to produce fine solid particles between 5 and 10 μm . the appropriate size reducing equipment is
- (A) fluid energy mill
 - (B) hammer mill
 - (C) jaw crusher
 - (D) smooth roll crusher

24. Slurries are most conveniently pumped by a
 (A) syringe pump (B) diaphragm pump
 (C) vacuum pump (D) gear pump
25. Which ONE of the following statements is CORRECT for the surface renewal theory?
 (A) Mass transfer takes place at steady state
 (B) Mass transfer takes place at unsteady state
 (C) Contact time is same for all the liquid elements
 (D) Mass transfer depends only on the film resistance
26. Steam economy of a multiple effect evaporator system is defined as
 (A) kilogram of steam used per hour
 (B) kilogram of steam consumed in all the effects for each kilogram of steam fed
 (C) kilogram of steam used in all the effects for each kilogram of water vaporized per hour
 (D) kilogram of water vaporized from all the effects for each kilogram of steam fed to the first effect
27. Catalytic cracking is
 (A) a hydrogen addition process (B) a carbon rejection process
 (C) an exothermic process (D) a coking process
28. Which ONE of the following statements is CORRECT?
 (A) The major components of biodiesel are triglycerides
 (B) Biodiesel is essentially a mixture of ethyl esters
 (C) Biodiesel is highly aromatic
 (D) Biodiesel has a very low aniline point
29. Which of the following can change if only the catalyst is changed for a reaction system?
 (A) Enthalpy of reaction (B) Activation energy
 (C) Free energy of the reaction (D) Equilibrium constant
30. For which reaction order, the half-life of the reactant is half of the full lifetime (time for 100% conversion) of the reactant?
 (A) Zero order (B) Half order (C) First order (D) Second order
31. In "RESEARCH" "R" means
 (A) Role (B) Retain (C) Rely (D) Round
32. Who defined "Research" as "systematized effort to gain new knowledge"
 (A) Tom & Zerry (B) Redman and Mory
 (C) F.W Taylor (D) Ross Taylor
33. The main purpose of research in education is to
 (A) help in individual's personal growth
 (B) increase the social prestige of an individual
 (C) increase individual's market value of jobs
 (D) help the individual to become an eminent educationist

34. A null hypothesis is
(A) Hypothesis of no difference
(B) Hypothesis that assigns value of zero to the variable
(C) Hypothesis of zero significance
(D) None of the above
35. What is the major attribute of Correlation Analysis?
(A) Association among variables
(B) Difference among variables
(C) Regression among variables
(D) Variations among variables
36. Where is the objective “observation” used?
(A) In survey
(B) In normal behaviour
(C) In conducting experiments
(D) In questionnaires’
37. Which of the following features are considered as critical in qualitative research?
(A) Collecting data with the help of standardized research tools.
(B) Design sampling with probability sample techniques.
(C) Collecting data with bottom-up empirical evidence.
(D) Gathering data with top-down schematic evidence.
38. A research intends to explore the result of possible factors for the organization of effective mid-day meal interventions. Which research method will be most appropriate for this study?
(A) Descriptive survey method
(B) Historical method
(C) Ex-post facto method
(D) Experimental method
39. The format of thesis writing is the same as in
(A) Writing of Seminar representation
(B) Preparation of research paper/article
(C) A research dissertation
(D) Presenting a workshop/conference paper
40. Type-I error occurs when we?
(A) Reject a false null hypothesis
(B) Reject a true null hypothesis
(C) Do not reject a false null hypothesis
(D) Do not reject a true null hypothesis
41. What does the longitudinal research approach actually deal with?
(A) Long-term research
(B) Short-term research
(C) Horizontal research
(D) None of the above
42. Evaluation Research is concerned with _____
(A) How well are we doing?
(B) Why are we doing?
(C) What are we doing?
(D) None of these
43. What is the main aim of interdisciplinary research?
(A) To over simplify the problem of research
(B) To bring out the holistic approach to research
(C) To create a new trend in research methodology
(D) To reduce the emphasis on a single subject in the research domain

44. A researcher is interested in studying the prospects of a particular political party in an urban area. So, what tool should he prefer for the study?
(A) Rating Scale (B) Interview (C) Questionnaire (D) Schedule
45. Which of the following is not the method of Research?
(A) Survey (B) Historical (C) Observation (D) Philosophical
46. Which one is called non-probability sampling?
(A) Quota sampling (B) Cluster sampling
(C) Systematic sampling (D) Stratified random sampling
47. On what basis did Jean Piaget give his theory of cognitive development of humans?
(A) Evaluation Research (B) Fundamental Research
(C) Applied Research (D) Action Research
48. What are the core elements of a dissertation?
(A) Introduction; Data Collection; Data Analysis; Conclusions and Recommendations
(B) Executive Summary; Literature Review; Data Gathered; Conclusions; Bibliography
(C) Research Plan; Research Data; Analysis; References
(D) Introduction; Literature Review; Research Methodology; Results; Discussions and Conclusions
49. "Sampling Cases" can be defined as
(A) Sampling using a sampling frame
(B) Identifying people who are suitable for research
(C) Literally the researcher's brief case
(D) A sampling of people, newspapers, television programs etc.
50. Which technique is generally followed when the population is finite?
(A) Systematic Sampling Technique (B) Purposive Sampling Technique
(C) Area Sampling Technique (D) None of these

Civil Engineering(Ph.D.)

1. What do you mean by synopsis of a research project?
(A) The blue print of research observations
(B) Extracts from the research observations
(C) A plan of the research
(D) Summary of the findings of the research
2. Inferring about the whole population on the basis of the observations made on a small part is called
(A) Deductive inference
(B) Inductive inference
(C) Objective inference
(D) Pseudo-inference
3. Type I error occurs when
(A) The null hypothesis is rejected even when it is true
(B) The null hypothesis is accepted even when it is false
(C) The null hypothesis as well as Alternative hypothesis, both are rejected
(D) None of the above
4. Scientific methods are used in
(A) Only research projects in pure sciences
(B) Social science researches
(C) Both 'A' and 'B'
(D) Neither 'A' nor 'B'
5. Which of the following is a non-probability sampling method?
(A) Simple random sampling
(B) Systematic sampling
(C) Cluster sampling
(D) Quota sampling
6. Action research means
(A) A longitudinal research
(B) An applied research
(C) Research which are initiated to solve the immediate problems
(D) All of the above
7. Reliability of a research result implies its
(A) Verifiability
(B) Validity
(C) Uniqueness
(D) Usefulness
8. In order to study the relationship of family size to income a researcher classifies his population into different income slabs and then takes a random sample from each slab. Which technique of sampling does he adopt?
(A) Cluster sampling
(B) Random sampling
(C) Stratified random sampling
(D) Systematic sampling
9. Which of the following is a suggested outline for report writing?
(A) Prefatory material
(B) Primary material
(C) Supplementary material
(D) Analytic material
10. A research problem is not feasible only when
(A) It consists of independent and dependent variables
(B) It is researchable
(C) It has utility and relevance
(D) It is new and adds something to knowledge

11. Experimental research aims at determining
 (A) The current status of processes opinion etc.
 (B) Relationship between two or more two variables
 (C) Tentative cause and effect relationships
 (D) True cause effect and relationships
12. The reading technique that would be employed to locate terms and references in an index
 (A) Skimming (B) Scanning (C) Pre-reading (D) Key-reading
13. Which of the following statements best completes the statement? Reviews in journals may provide the researcher with an appraisal of
 (A) New publications (B) Current unpublished research
 (C) Other journal's contents (D) The journal's content
14. Which of the following statements best describes an Annotated Bibliography?
 (A) A list of references extracted from a bibliography
 (B) A reference to publications from a clearinghouse
 (C) A reference to bibliographies held at an institution
 (D) A list of references with notes about each reference
15. Which of the following statements best describes a secondary source of literature?
 (A) Interpretative literature (B) Reviews
 (C) Reports (D) Conceptual literature
16. The maximum allowable compressive stress corresponding to lateral buckling in a discretely laterally supported symmetrical I beam does not depend upon:
 (A) The modulus of elasticity
 (B) The radius of gyration about the minor axis
 (C) The span length of the beam
 (D) The ratio of overall depth of thickness of the flange
17. A road is provided with a horizontal circular curve having deflection angle of 55° and centre line radius of 250 m. A transition curve is to be provided at each end of the circular curve of such a length that the rate of gain of radial acceleration is 0.3 m/s^3 at a speed of 50 km per hour. Length of the transition curve required at each of the ends is
 (A) 2.57 m (B) 33.33 m (C) 35.73 m (D) 1666.67 m
18. A saturated clay stratum draining both at the top and bottom undergoes 50 percent consolidation in 16 years under an applied load. If an additional drainage layer were present at the middle of the clay stratum, 50 percent consolidation would occur in
 (A) 2 years (B) 4 years (C) 8 years (D) 16 years
19. A person standing on the bank of a canal drops a stone on the water surface. He notices that the disturbance on the water surface is not travelling upstream. This is because the flow in the canal is
 (A) Sub-critical (B) Super-critical (C) Steady (D) Uniform

20. If the porosity of a soil sample is 20%, the void ratio is
 (A) 0.20 (B) 0.80 (C) 1.00 (D) 0.25
21. The maximum deflection of a structure should not normally exceed lesser of the span/350 or
 (A) 10 mm (B) 15 mm (C) 20 mm (D) 25 mm
22. For nominal mix concrete M 15, the required weight of fine and coarse aggregates is 350 kg and the volume of water is
 (A) 30 litres (B) 32 litres (C) 34 litres (D) 45 litres
23. The rate of accumulation of sludge in septic tanks is recommended as
 (A) 30 litres/person/year (B) 25 litres/person/year
 (C) 30 litres/person/month (D) 25 litres/person/month
24. In a reinforced concrete beam-column, the increase in the flexural strength along with the increase in the axial strength occurs
 (A) Beyond the elastic limit of the material
 (B) When the yield of the tension reinforcement governs the strength
 (C) When the crushing of the concrete in the compression zone governs the strength
 (D) Never
25. The area under the Beta distribution curve is divided into two equal parts
 (A) Most likely time (B) Optimistic time
 (C) Pessimistic time (D) Expected time
26. The ideal form of curve for the summit curve is:
 (A) Spiral (B) Parabola (C) Circle (D) Lemniscate
27. The lateral ties in a reinforced concrete rectangular column under: axial compression is used to:
 (A) Avoid the buckling of the longitudinal steel under compression
 (B) Provide adequate shear capacity
 (C) Provide adequate confinement to concrete
 (D) Reduce the axial deformation of the column
28. The specific gravity of paving bitumen as per IS: 73-1992 lies between
 (A) 1.10 and 1.06 (B) 1.06 and 1.02 (C) 1.02 and 0.97 (D) 0.97 and 0.92
29. Weep holes are provided in retaining and breast walls
 (A) To drain off the water from the filling (B) To ventilate the stone masonry
 (C) To add architectural beauty (D) To increase compaction of the earth retained
30. In the case of dormant cracks wider than about 1mm, it is more economical to use
 (A) Epoxy resin (B) Grouting (C) Tensioning (D) Ranging

31. The shape of the cross-section, which has the largest shape factor, is
 (A) Rectangular (B) I-section (C) Diamond (D) Solid circular
32. The floor area includes the area of the balcony up to
 (A) 100% (B) 75% (C) 50% (D) 25%
33. An isochrone is a line on the basin map
 (A) Joining rain gauge stations having equal rainfall-duration
 (B) Joining points having equal rainfall depth in a given time interval
 (C) Joining points having equal time of travel of surface runoff to the catchment outlet
 (D) Joining points which are at equal distance from the catchment outlet
34. In a steady radial flow into an intake, the velocity is found to vary as $(1/r^2)$, where r is the radial distance. The acceleration of the flow is proportional to
 (A) $1/r^5$ (B) $1/r^3$ (C) $1/r^4$ (D) $1/r$
35. A steel beam supporting loads from the floor slab as well as from wall is termed as
 (A) Stringer beam (B) Lintel beam (C) Spandrel beam (D) Header beam
36. The problem of lateral buckling can arise only in those steel beams which have
 (A) Moment of inertia about the bending axis larger than the other
 (B) Moment of inertia about the bending axis smaller than the other
 (C) Fully supported compression flange
 (D) None of the above
37. A district road with a bituminous pavement has a horizontal curve of 1000 m for a design speed of 75 km ph. The super-elevation is
 (A) 1 in 40 (B) 1 in 50 (C) 1 in 60 (D) 1 in 70
38. If a is the optimistic time, b is the pessimistic time and m is most likely time of an activity, the expected time of the activity, is
 (A) $a + m + b$ (B) $a + 2m + b$ (C) $a + 4m + b$ (D) $a + 5m + b$
39. The effective length of a compression member of length L held in position and restrained in direction at one end and effectively restrained in direction but not held in position at the other end, is
 (A) L (B) $0.67 L$ (C) $0.85 L$ (D) $1.5 L$
40. Water flows at a rate of $10 \text{ m}^3/\text{s}$ in a rectangular channel 3 m wide. The critical depth of flow is
 (A) 1.13 m (B) 2 m (C) 1.45 m (D) 1.04 m
41. In a tensile test, near the elastic limit zone, the
 (A) Tensile stress increases in linear proportion to the stress
 (B) Tensile stress increases at a faster rate
 (C) Tensile stress decreases at a faster rate
 (D) None of the mentioned

42. Cup and cone type fracture occurs in the case of
 (A) Cast iron (B) Soft brass
 (C) Round specimen of ductile metal (D) Flat tensile specimen of ductile metal
43. When there is no recirculation of sewage, then recirculation factor is
 (A) 0 (B) 1 (C) Infinity (D) None of these
44. A five-day B.O. D. at 15 degree C of the sewage of a town is 100 kg/day. If the 5-day B.O.D per head at 15 degree C for standard sewage is 0.1 kg/day, then population equivalent is
 (A) 100 (B) 1000 (C) 5000 (D) 10000
45. For the manufacture of plywood, veneers are placed so that grains of adjacent veneers
 (A) Run at right angles (B) Parallel
 (C) Inclined at 45° (D) Inclined at 60°
46. The technique for establishing and maintaining priorities among the various jobs of a project, is known
 (A) Event flow scheduling technique (B) Critical ratio scheduling
 (C) Slotting technique for scheduling (D) Short interval scheduling
47. Shear cracks between the main wall and cross wall can be corrected using:
 (A) Grouting (B) Rebuilding (C) Guining (D) Toothing
48. If duty (D) is 1428 hectares/cumec and base period (B) is 120 days for an irrigated crop, then delta (Δ) in meters is given by
 (A) 102.8 (B) 0.73 (C) 1.38 (D) 0.01
49. For filling cracks in masonry structures, the type of bitumen used, is
 (A) Cut-back bitumen (B) Bitumen-emulsion
 (C) Blown bitumen (D) Blastic bitumen
50. For completion of a project, the critical path of the network represents
 (A) Minimum time (B) Maximum time
 (C) Maximum cost (D) Minimum cost

x-x-x

Computer Science & Engineering(Ph.D.) (CSE)

1. A RAM chip has a capacity of 1024 words of 8 bits each ($1K \times 8$). The number of 2×4 decoders with enable line needed to construct a $16K \times 16$ RAM from $1K \times 8$ RAM is
(A) 4 (B) 5 (C) 6 (D) 7
2. The effective address of the following instruction is MUL 5(R1, R2)
(A) $5+R1+R2$ (B) $5+(R1 \cdot R2)$ (C) $5+[R1]+[R2]$ (D) $5*([R1]+[R2])$
3. How many number of bits are used in this instruction?
LDA 8085H

Hint: x and y are given in binary form

- (A) $2^x + 2^y$ (Here, $x=0100$ and $y=0000$) (B) $2^x + 2^y$ (Here, $x=0100$ and $y=0011$)
- (C) $2^x + 2^y$ (Here, $x=0101$ and $y=0000$) (D) $2^x + 2^y$ (Here, $x=0101$ and $y=0011$)
4. If memory size is 64Kb then what amount of memory in I/O interfacing is taken by memory mapping and by peripheral mapping?
(A) Equally divided between both mapping
(B) Memory mapping takes all 64 Kb
(C) Peripheral mapping takes half of 64 Kb
(D) Logical mapping takes half of 128Kb
5. $(2FAOC)_{16}$ is equivalent to
(A) $(195\ 084)_{10}$ (B) $(001011111010\ 0000\ 1100)_2$
(C) Both A and B (D) $(11111010\ 0000\ 1100)_2$
6. If memory access takes 20 ns with cache and 110ns (nano-seconds) without it, then the ratio (cache uses a 10ns memory) is
(A) 90% (B) 87% (C) 93% (D) 89%
7. Choose correct option:-
Assertion (A_1): To perform division in 8085 microprocessor a repeated subtraction method is followed.
Assertion (A_2): DIV instruction is used to perform division in 8085.
Reason (R_1): As DIV instruction is not available in 8085, it is available in 8086.
Reason (R_2): DIV instruction can be used in 8085 as 8086 microprocessor has large instruction set than 8085 microprocessor.
(A) Assertion A_1 is false and Reason R_2 is true
(B) Assertion A_2 is true and Reason R_2 is false
(C) Assertion A_2 is false and Reason R_1 is false
(D) Assertion A_1 is true and Reason R_1 is true

8. The worst-case height of an AVL tree?
 (A) $0.97 \log n$ (B) $1.44 \log n$ (C) $0.82 \log n$ (D) $n^2 \log n$
9. For which of the following does there exist a tree satisfying the specified constraints?
 (A) A binary tree with 65 leaves and height 6.
 (B) A binary tree with 33 leaves and height 5.
 (C) A full binary tree with 23 leaves and height 23.
 (D) A rooted tree of height 3, every vertex has at most 3 children. There are 40 total vertices.
10. The Bellman Ford Algorithm returns _____ value?
 (A) String
 (B) Boolean
 (C) Double
 (D) Integer
11. In each case the depth-first sequence of an ordered rooted spanning tree for a graph G is given. Also given are the non-tree edges of G. Which of these spanning trees is a depth-first spanning tree?
 (A) 123242151 AND {3, 4}, {1, 4}
 (B) 123242151 AND {4, 5}, {1, 3}
 (C) 123245421 AND {2, 5}, {1, 4}
 (D) 123245421 AND {3, 4}, {1, 4}
12. For which of the following does there exist a tree satisfying the specified constraints?
 (A) A full binary tree with 31 leaves each leaf of height 5.
 (B) A rooted tree of height 3 where every vertex has at most 3 children and there are 41 total vertices.
 (C) A full binary tree with 11 vertices and height 6.
 (D) A binary tree with 2 leaves and height 100.
13. Which method of encoding does not consider the probability of occurrence of symbols?
 (A) Static Huffman Coding (B) Variable Length Coding
 (C) Adaptive Huffman Coding (D) Fixed Length Coding
14. What is the functionality of the following chunk of code?
- ```

public int funct(int val)
{
 Node temp = head;
 int var = 0;
 while(temp != null)
 {
 if(temp.getData() == val)
 {
 return var;
 }
 var = var+1;
 temp = temp.getNext();
 }
 return Integer.MIN_VALUE;
}

```

- (A) Find and delete a given element in the list
- (B) Find and return the given element in the list
- (C) Find and return the position of the given element in the list
- (D) Find and insert a new element in the list
15. The **best case complexity of selection sort**
- (A)  $n^2$  (B)  $n \log n$  (C)  $n$  (D)  $n^3$
16. The set of all strings over the alphabet  $S = \{a, b\}$  (including  $\epsilon$ ) is denoted by
- (A)  $(a + b)^*$  (B)  $(a + b)^+$  (C)  $a+b^+$  (D)  $a^*b^*$
17. Which of the following regular expression identity is true?
- (A)  $r^* = r^*$  (B)  $(r + s)^* = r^* + s^*$
- (C)  $r^*s^* = r^* + s^*$  (D)  $(r^*s^*)^* = (r + s)^*$
18. The major difference between a moore and mealy machine is that
- (A) Output of the former depends on the present state and present input
- (B) Output of the former depends only on the present state
- (C) Output of former depends only on the present input
- (D) Output of the former depends only on input state
19. Which of the following statement is wrong?
- (A) Any regular language has an equivalent context-free grammar
- (B) Some non-regular languages can't be generated by any context-free grammar
- (C) Intersection of context free language and a regular language is always context-free
- (D) All languages can be generated by context- free grammar
20. Let  $L1 = \{w \in \{0,1\}^* \mid w \text{ has at least as many occurrences of } (110)\text{'s as } (011)\text{'s}\}$ .  
Let  $L2 = \{w \in \{0,1\}^* \mid w \text{ has at least as many occurrences of } (000)\text{'s as } (111)\text{'s}\}$ . Which of the following is correct?
- (A)  $L2$  is regular (B)  $L1$  and  $L2$  are regular
- (C)  $L1$  is regular but not  $L2$  (D) None of them are regular
21. Heap is an example of
- (A) complete binary tree (B) spanning tree
- (C) sparse tree (D) binary search tree
22. When is type checking done?
- (A) During Lexical Analysis (B) During Syntax-Directed Translation
- (C) During Syntax Analysis (D) During Code Optimization
23. Which symbol table implementation is based on the property of locality of reference?
- (A) Linear List (B) Search Tree
- (C) Hash Table (D) Self Organization
24. Which statement is false?
- (A) Unambiguous grammar has both kind of derivations
- (B) An LL(1) parser is a top-down parser

- (C) LALR is more powerful than SLR
- (D) All the above
25. If in XYXXYWZ, each letter can occur at most as many times as it is occurring in it then how many four-letter words can be formed from the letters in XYXXYWZ?  
 (A) 92 (B) 95 (C) 110 (D) 114
26. Two teams, P and Q are playing a badminton game. For securing the win in the game, the team P has to win either two round back-to-back (in a row) or a set of three rounds before another team (team Q). How many ways this tournament can occur?  
 (A) 8 (B) 9 (C) 10 (D) 11
27. Suppose  $p(n) = \frac{n}{2} + \frac{1-(-1)^n}{4}$  where  $\forall n \in \mathbb{Z}$ . Thus,  $p: \mathbb{Z} \rightarrow \mathbb{Z}$ ,  $\mathbb{Z}$  the set of all integers. Which is TRUE?  
 (A) p is a function and is not either one-to-one or not onto  
 (B) p is a function and is one-to-one and onto both  
 (C) p is not a function from  $\mathbb{Z} \rightarrow \mathbb{Z}$  because  $\frac{n}{2} \notin \mathbb{Z}$   
 (D) p is a function and is not one-to-one but onto
28. Which of the following statements is not correct?  
 (A)  $\{45, 46, 47\} \subseteq P$  implies that  $45 \in P$  and  $\{46, 47\} \subseteq P$   
 (B)  $\{45, 46, 47\} \in P$  and  $\{45, 46\} \in Q$  implies that  $\{47\} \subseteq P - Q$   
 (C)  $P \cap Q \supseteq \{45, 46, 47\}$  implies that  $\{45, 46, 47\} \subseteq P$  and  $\{45, 46, 47\} \subseteq Q$   
 (D)  $P - Q \supseteq \{46, 47\}$  and  $\{44, 45\} \subseteq Q$  implies that  $\{44, 45, 46, 47\} \subseteq P \cup Q$
29. Banker's algorithm for resource allocation deals with  
 (A) Deadlock prevention (B) Deadlock avoidance  
 (C) Deadlock recovery (D) Mutual exclusion
30. Which of the following are loaded into main memory when the computer is booted?  
 (A) Internal command instructions (B) External command instructions  
 (C) Utility programs (D) Word processing instructions
31. Page stealing  
 (A) is a sign of an efficient system  
 (B) is taking page frames from other working sets  
 (C) should be the tuning goal  
 (D) is taking larger disk spaces for pages paged out
32. Address generated by CPU  
 (A) Physical Address (B) Absolute Address  
 (C) Logical Address (D) Memory Address

33. Situations where two or more processes are reading or writing some shared data and the final result depends on who runs precisely are called
- (A) Race conditions (B) Critical sections  
(C) Mutual sections (D) Message passing
34. The two steps the operating system takes to use a disk to hold its files are \_\_\_\_\_ and \_\_\_\_\_
- (A) Partitioning & logical formatting (B) Swap space creation & caching  
(C) Caching & logical formatting (D) Logical formatting & swap space creation
35. Which one of the following is a type of Data Manipulation Command?
- (A) Create (B) Alter (C) Delete (D) Drop
36. In which one of the following, the multiple lower entities are grouped (or combined) together to form a single higher-level entity?
- (A) Specialization (B) Generalization (C) Aggregation (D) Summarization
37. In SQL, which command is used to remove a stored function from the database?
- (A) Remove (B) Delete (C) Drop (D) Erase
38. Which of the following is correct?
- (A) B-trees are for storing data on disk and B<sup>+</sup> trees are for main memory  
(B) Range queries are faster on B<sup>+</sup> trees  
(C) B-trees are for primary indexes and B<sup>+</sup> trees are for secondary indexes  
(D) The height of a B<sup>+</sup> tree is independent of the number of records
39. The feature that is considered as critical in qualitative research
- (A) Collecting data with the help of standardized research tools.  
(B) Design sampling with probability sample techniques.  
(C) Collecting data with bottom-up empirical evidence.  
(D) Gathering data with top-down schematic evidence.
40. In order to pursue the research, which of the following is priorly required?
- (A) Developing a research design  
(B) Formulating a research question  
(C) Deciding about the data analysis procedure  
(D) Formulating a research hypothesis
41. How to judge the depth of any research?
- (A) By research title (B) By research duration  
(C) By research objectives (D) By total expenditure on research
42. Which technique is generally followed when the population is finite?
- (A) Systematic Sampling Technique (B) Purposive Sampling Technique  
(C) Area Sampling Technique (D) Logical Sampling Technique

43. What do you mean by Unit of Analysis?  
 (A) Main parameter (B) Variables (C) Sample (D) Constructs
44. What is the name of the conceptual framework in which the research is carried out?  
 (A) Research hypothesis (B) Synopsis of Research  
 (C) Research paradigm (D) Research design
45. Which one among the following variables cannot be expressed in quantitative terms?  
 (A) Numerical Aptitude (B) Marital Status  
 (C) Socio-economic Status (D) Professional Attitude
46. Which one among the following phrases does not correspond to the meaning of research as a process?  
 (A) Problem Solving (B) Trial and Error  
 (C) Objective Observation (D) Systematic Activity
47. What are the core elements of a dissertation?  
 (A) Introduction; Data Collection; Data Analysis; Conclusions and Recommendations  
 (B) Executive Summary; Literature Review; Data Gathered; Conclusions; Bibliography  
 (C) Research Plan; Research Data; Analysis; References  
 (D) Introduction; Literature Review; Research Methodology; Results; Discussions and Conclusions
48. The right to use a domain name is delegated by domain name registers which are accredited by \_\_\_\_\_  
 (A) Internet Architecture Board  
 (B) Internet Society  
 (C) Internet Research Task Force  
 (D) Internet Corporation for Assigned Names and Numbers
49. When 2 or more bits in a data unit has been changed during the transmission, the error is called \_\_\_\_\_  
 (A) Random Error (B) Burst Error  
 (C) Inverted Error (D) Double Error
50. Which address is used on the internet for employing the TCP/IP protocols?  
 (A) Physical Address and Logical Address  
 (B) Port Address  
 (C) Specific Address  
 (D) Home Address

**Electronics & Communication Engineering(Ph.D.) (ECE)**

1. The angle between vectors  $\vec{a} = -\hat{i} + \hat{j} - \hat{k}$ , and  $\vec{b} = \hat{i} - \hat{j}$  is  
 (A)  $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$  (B)  $\cos^{-1}\left(-\frac{2}{\sqrt{3}}\right)$   
 (C)  $\cos^{-1}\left(-\sqrt{2}\right)$  (D)  $\cos^{-1}\left(-\sqrt{\frac{3}{2}}\right)$
2. If  $P(A) = \frac{7}{11}$ ,  $P(B) = \frac{6}{11}$ ,  $P(A \cup B) = \frac{8}{11}$ , then  $P(A/B)$  is  
 (A) 3/5 (B) 2/3 (C) 1/2 (D) 1
3. Which of the following function is a solution of differential equation  $xy' - y = 0$ ?  
 (A)  $y = 4x$  (B)  $y = x^2$  (C)  $y = -4x$  (D)  $y = 2x$
4. The standard deviation of data consisting of five numbers 3,5,6,5,11 is  
 (A) 3.68 (B) 3.20 (C) 2.68 (D) 2.9
5. If in Poisson distribution the probabilities  $P(1)$  and  $P(2)$  are same, then the mean is  
 (A)  $\sqrt{2}$  (B)  $\sqrt{3}$  (C)  $\sqrt{5}$  (D)  $\sqrt{7}$
6. If two quadrature Gaussian channels are added, the envelope has following distribution  
 (A) Gaussian Inverse (B) Gamma (C) Rayleigh (D) Nakagami
7. The cumulative distribution function (cdf) of a random variable  $X$  is given by
 
$$F(x) = \begin{cases} 0, & \infty < x \leq 0 \\ kx^2, & 0 < x \leq 10 \\ 100k, & 10 < x \leq \infty \end{cases}$$
 The value of  $k$  is  
 (A) 100 (B) 50 (C)  $\frac{1}{50}$  (D)  $\frac{1}{100}$
8. Two LTI systems with impulse response  $h_1(t)$  and  $h_2(t)$  are connected in cascade, the overall impulse response is  
 (A)  $h_1(t) + h_2(t)$  (B)  $h_1(t)h_2(t)$   
 (C)  $h_1(t) * h_2(t)$  (D)  $\frac{h_1(t)h_2(t)}{h_1(t)+h_2(t)}$
9. Sum of  $N$  independent exponential random variables (RVs) is  
 (A) Uniform RV (B) Binomial RV  
 (C) Normal RV (D) Gamma RV
10. Consider a population of  $N$  items and out of these  $n$  are selected as a sample with replacement. The total possible samples are  
 (A)  $N$  (B)  $n^N$  (C)  $n \log(n)$  (D)  $N^n$
11. Random Variables  $X$  and  $Y$  have variances 0.2 and 0.5 respectively. The variance of  $Z = 5X - 2Y$  is  
 (A) 3 (B) 4 (C) 5 (D) 7
12. The Eigenvalues of matrix  $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$  are  
 (A)  $e^{\pm j\frac{\theta}{2}}$  (B)  $e^{\pm j\theta}$  (C)  $e^{\pm j2\theta}$  (D)  $e^{\pm j3\theta}$

13. The value of  $\hat{i} \times (\vec{a} \times \hat{i}) + \hat{j} \times (\vec{a} \times \hat{j}) + \hat{k} \times (\vec{a} \times \hat{k})$  is  
 (A) 0 (B)  $\vec{a}$  (C)  $2\vec{a}$  (D)  $-\vec{a}$
14. Which of the following is not a convex function?  
 (A) Circle (B) Rectangle (C) Ellipse (D) Star
15. Divergence of the vector  $e^{-x} \sin y \hat{i} - e^{-x} \cos y \hat{j}$  is  
 (A) 2 (B) 1 (C) -1 (D) 0
16. Stoke's theorem uses the following operation  
 (A) Divergence (B) Gradient (C) Curl (D) Laplacian
17. The autocorrelation function  $R_X(\tau)$  must satisfy  
 (A)  $R_X(\tau)$  is always odd (B)  $R_X(\tau) \geq R_X(0)$   
 (C)  $R_X(0) \geq R_X(\tau)$  (D)  $-\frac{1}{2} \leq R_X(\tau) \leq \frac{1}{2}$
18. The Laplace equation value of the potential field  $V = x^2 - y^2 + z^2$  is  
 (A) 0 (B) 2 (C) 4 (D) 6
19. The binary equivalent of Grey code 1110011101 is  
 (A) 1110011101 (B) 1001010011  
 (C) 1011101001 (D) 1001001001
20. The increase in the capacity of a cellular communication is generally not achieved by  
 (A) Decreasing cell size (B) Decreasing BS power  
 (C) Increasing cell size (D) Increasing antenna range
21. The size of TCP segment header ranges between  
 (A) 16-32 Bytes (B) 20-40 Bytes (C) 20-60 Bytes (D) 40-60 Bytes
22. The number of layers in ATM network model are  
 (A) 3 (B) 4 (C) 5 (D) 6
23. Open loop Op-Amps are not recommended for linear applications because  
 (A) O/P reaches positive saturation  
 (B) O/P reaches negative saturation  
 (C) O/P switches between positive and negative saturation  
 (D) None of the above
24. For radar signal processing, which of the following is not generally a performance index?  
 (A) Peak Side Lobe Levels (B) Autocorrelation Function  
 (C) ISI (D) Ambiguity Function
25. The smallest resistor in 8-bit DAC is R. What will be the largest value?  
 (A) 8R (B)  $8^2R$  (C)  $2^8R$  (D)  $2^7R$
26. The constellation points are farthest in following digital modulation  
 (A) 16-ASK (B) 32-QAM (C) 16-PSK (D) QPSK

27. The number of FFs required in maximum length shift register to get a PN sequence with processing gain 1600 are  
 (A) 16 (B) 10 (C) 11 (D) 12
28. To minimize ISI, the best Roll-off factor of filter is  
 (A) 0 (B)  $\frac{1}{2}$  (C) 1 (D)  $\infty$   
 (2)
29. The number of orthonormal signals required to represent 4 mutually independent energy signals is  
 (A) Less than 4 (B) Equal to 4  
 (C) Greater than 4 (D) All options A,B,C possible
30. Which of the following is not a channel degradation?  
 (A) ISI (B) Jamming Margin (C) AWGN (D) Multipath
31. In complex signal representation of digital signal  $g(t)$ , the spectrum of pre-envelope  $g_+(t)$ , i.e.  $G_+(f)$  satisfies the following  
 (A)  $G_+(f) = 0$  for  $f \geq 0$  (B)  $G_+(f) = 0$  for  $f \leq 0$   
 (C)  $G_+(f) = 0$  at  $f = 0$  (D)  $G_+(f) \neq 0$  for all  $f$
32. Temporal diversity can be achieved by  
 (A) Repetition Coding (B) OFDM  
 (C) MIMO (D) Combination of MIMO&OFDM
33. Which of the following is a 2.5G standard?  
 (A) UMTS (B) cdma 2000 (C) NAMPS (D) EDGE
34. The best diversity method is  
 (A) Blind Equalization (B) Trellis Coded Modulation  
 (C) Maximum Ratio Combining (D) Equal Gain Combining
35. For DFT and DTFT spectrums, following is true  
 (A) Both are discrete  
 (B) DFT spectrum is continuous and DTFT spectrum is discrete  
 (C) DTFT spectrum is continuous and DFT spectrum is discrete  
 (D) Both are continuous
36. Probability of error in QPSK is  
 (A)  $erf \sqrt{\frac{E_b}{N_0}}$  (B)  $erfc \sqrt{\frac{E_b}{N_0}}$  (C)  $\frac{1}{2} erf \sqrt{\frac{E_b}{N_0}}$  (D)  $\frac{1}{2} erfc \sqrt{\frac{E_b}{N_0}}$
37. Potential between two points  $p(1,1,0)$  and  $q(2,1,3)$  with  $\mathbf{E} = 40xy\hat{i} + 20x^2y\hat{j} + 2\hat{k}$  is  
 (A) 104 (B) 105 (C) 106 (D) 107
38. Laplace transform of  $\sin\left(\frac{t}{2}\right)u\left(\frac{t}{2}\right)$  is  
 (A)  $\frac{1}{s^2+1}$  (B)  $\frac{s}{s^2+1}$  (C)  $\frac{2s}{(2s)^2+1}$  (D)  $\frac{2}{(2s)^2+1}$

39. Laplace transform of  $\frac{d}{dt}(te^{-t}u(t))$  is  
 (A)  $\frac{1}{s(s+1)^2}$  (B)  $\frac{s}{(s+1)^2}$  (C)  $\frac{e^{-s}}{s+1}$  (D)  $\frac{e^{-s}}{(s+1)^2}$
40. Impulse response of an LTI system is  $h(t) = e^{-5|t|}$ . The system is  
 (A) Causal and Stable (B) Non-causal and Unstable  
 (C) Non-causal and stable (D) Causal and Unstable
41. The inverse LT of  $\ln\left(\frac{s+3}{s+2}\right)$  is  
 (A)  $\frac{e^{-3t}-e^{-2t}}{t}$  (B)  $\frac{e^{-2t}-e^{-3t}}{t}$  (C)  $\frac{e^{-3t}+e^{-2t}}{t}$  (D)  $\frac{e^{-3t}+e^{2t}}{t}$
42. If  $y(n) = x(-n)$ , ROC of  $y(n)$  and  $x(n)$  are  
 (A) Same (B) Negative of each other  
 (C) Reciprocal of each other (D) Complementary
43. Range of frequencies in VHF band is  
 (A) 3-30 MHz (B) 30-300 MHz  
 (C) 300MHz-3GHz (D) 300KHz-3MHz
44. A signal  $h(t)$  and its Hilbert transform  $\hat{h}(t)$  has  
 (A) Same power (B) Same energy density spectrum  
 (C)  $180^\circ$  phase difference (D)  $60^\circ$  phase difference
45. The first moment of power delay profile is  
 (A) RMS delay spread (B) Excess Delay Spread  
 (C) Mean Excess Delay (D) Doppler spread
46. In small scale region, time varying nature of channel is described by  
 (A) Delay spread and Coherence time (B) Delay spread and Doppler spread  
 (C) Doppler spread and Coherence time (D) Coherence Bandwidth and Delay spread
47. In equalization, which of the following is a blind algorithm?  
 (A) Linear adaptive algorithm (B) Non-Linear adaptive algorithm  
 (C) Constant Modulus Algorithm (D) Spatial Adaptive Algorithm
48. In Maximum ratio combining, the overall output SNR is equal to  
 (A) Maximum of all SNRs (B) Sum of all SNRs  
 (C) Average of all SNRs (D) Sum of selective SNRs
49. Which of the following is the correct order of turn-off times?  
 (A) MOSFET < BJT < IGBT < SCR  
 (B) MOSFET < IGBT < BJT < SCR  
 (C) SCR < BJT < IGBT < MOSFET  
 (D) BJT < MOSFET < IGBT < SCR
50. Which of the following equations gives the relation between  $I_D$  and  $V_{gs}$ ?  
 (A)  $I_D = I_{DSS} (1 - V_{gs}/V_p)^2$  (B)  $I_D = I_{DSS} (1 - V_{gs}/V_p)^1$   
 (C)  $I_D = I_{DSS} (1 - V_{gs}/V_p)^3$  (D)  $I_D = I_{DSS} (1 - V_{gs}/V_p)^4$

**Food Technology(Ph.D)**

1. Sealed tube containing equal number of spores of an isolate from a spoiled canned food were heated for 10 and 15 min at 115.5°C. The survivors were, respectively 4600 and 160. The lag time for heating the tubes to 115.5°C was established in prior experiments to be 0.5 min. D value is  
 (A) 1.23min                      (B) 3.42min                      (C) 7.89 min                      (D) 4.56 min
2. Which one is not the appropriate reason when Oil bearing material is cooked prior to oil extraction because cooking  
 (A) Coagulates protein                      (B) Frees oil  
 (C) Increases pressing efficiency                      (D) Cooking enhance nutritive value
3. In solvent extraction process residual oil in meal present in the range of  
 (A) 0.1-1%                      (B) 1-5%                      (C) 5-10%                      (D) 10-15%
4. The miscelle in solvent extraction of oil from oil seed flakes consists of  
 (A) Oil and water                      (B) Oil, water and solvent  
 (C) Water and solvent                      (D) Oil and solvent
5. The physiological effects of dietary fibers includes  
 (A) Weight reduction, reduce thyroid problem and cancer control  
 (B) Controlling of protein content  
 (C) Increase fat  
 (D) Enhance sleeping
6. Gram staining was developed by  
 (A) French microbiologists Louis Pasteur                      (B) Dutch lence maker Leeuwenhoek  
 (C) Danish physician Christian Gram                      (D) Dutch Physician Christian Gram
7. Match the toxicants of plant foods in Group I with their main plant source given in Group II.

| Group I                                  | Group II                                    |
|------------------------------------------|---------------------------------------------|
| P) Gossypol                              | 1) Khesari Dahl ( <i>Lathyrus sativus</i> ) |
| Q) Vicine                                | 2) Cotton seeds                             |
| R) Glucosinolates                        | 3) Fava beans                               |
| S) BOAA (beta-N- Oxalyl Amino L-Alanine) | 4) Rapeseeds                                |

- (A) P-2, Q-3, R-4, S-1                      (B) P-2, Q-4, R-3, S-1  
 (C) P-3, Q-1, R-2, S-4                      (D) P-4, Q-3, R-1, S-2
8. Deficiency of vitamin B<sub>12</sub> causes  
 (A) Microcytic anemia                      (B) Macrocytic anemia  
 (C) Magaloblasticanemia                      (D) Hemosiderosis
  9. Saponins are present in  
 (A) Milk products                      (B) Onion                      (C) Legumes                      (D) Oats

10. The hormone that plays a key role in regulating appetite and metabolism is  
 (A) Estrogen (B) Leptin (C) Gralin (D) Glucagon
11. When wheat is stored between 16 and 30% moisture content, the mycotoxins of the type can be formed is  
 (A) Aflatoxin (B) Ochratoxin (C) Botulinum (D) Salmonella
12. For the effectiveness of operations of stone separator in grain cleaning/separation, the most important parameters are  
 (A) Kinematic Properties (B) Continuous feeding  
 (C) Uniform feeding (D) Grain dimensions and size
13. During grain cleaning disc. separators are used to remove cereal grains of same  
 (A) Dimension (B) Length (C) Breadth (D) Density
14. Drying mode commonly used in all types of cereal grain is  
 (A) Radiation (B) Conduction (C) Convection (D) Vacuum
15. Winterization is  
 (A) Removing long chain saturated fatty acids from oils  
 (B) Plasticizing solid fats  
 (C) Ageing of oils  
 (D) Removing volatiles from oils
16. The solution which draws fluids from the blood vessels is  
 (A) Hypertonic solution (B) Normal solution  
 (C) Saturated solution (D) Hypotonic solution
17. Type of spectrophotometer to analyse minerals is  
 (A) Fluorometer (B) UV spectrometer  
 (C) Vis spectrometer (D) Atomic absorption spectrometer
18. Healthy child gets first teeth by  
 (A) Four months (B) Eight months  
 (C) Six months (D) One year
19. Physical hardness of which cereal grain is highest  
 (A) Rice (B) Jawar (C) Millet (D) Corn
20. Shear thinning liquid is also known as  
 (A) Dilatant fluid (B) Pseudoplastic fluid  
 (C) Newtonian fluid (D) Casson plastic
21. Which one of the following is NOT a source of caffeine?  
 (A) Coffee (B) Cocoa beans (C) Corn syrup (D) Tea leaves
22. Which of the following carbohydrates is NOT classified as dietary fibre?  
 (A) Agar (B) Pectin (C) Sodium alginate (D) Tapioca starch
23. The muscle fatigue is due to  
 (A) Change in pH (B) Breakdown of lactic acid  
 (C) Breakdown of amino acids (D) Change in temperature

24. Creatine, a nitrogenous compound is present in foods like  
(A) Fruits and vegetables (B) Meat and fish  
(C) Cereals and legumes (D) Jam and Jelly
25. The diet that helps to increase glycogen stores and extend endurance  
(A) High protein diet (B) High CHO diet  
(C) High creatine diet (D) High meat diet
26. Which is not the characteristic of research?  
(A) Basic Research (B) Holistic Perspective  
(C) Context Sensitivity (D) Ex-Post Facto Research
27. A hypothesis is a  
(A) Tentative statement whose validity is still to be tested  
(B) Supposition which is based on the past experiences  
(C) Statement of fact  
(D) All of the above
28. What do you mean by synopsis of a research project?  
(A) The blue print of research  
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(A) It is a framework in which research work has to be done  
(B) It simplifies the logical process of arriving at the solution  
(C) It is a restrictive condition  
(D) None of the above
30. A null hypothesis is  
(A) hypothesis of no difference  
(B) Hypothesis that assigns value of zero to the variable  
(C) Hypothesis of zero significance  
(D) None of the above
31. Type-1 Error occurs when  
(A) The null hypothesis is rejected even when it is true  
(B) The null hypothesis is accepted even when it is false  
(C) The null hypothesis as well as Alternative hypothesis, both are rejected  
(D) None of the above
32. Which of the following is a non-probability sampling method?  
(A) Simple random sampling (B) Systematic sampling  
(C) Cluster sampling (D) Quota sampling
33. In which of the following cases, the formation of hypothesis may not be necessary?  
(A) Investigative historical studies (B) Experimental studies  
(C) Normative studies (D) Survey studies

34. A researcher divides the whole population in different parts and then fixes the no. of units from each of the parts that are to be included in the sample. The method of sampling used by him is  
 (A) Stratified random sampling (B) Cluster sampling  
 (C) Quota sampling (D) All of these
35. For the population with finite size which of the following sampling method is generally preferred?  
 (A) Cluster sampling (B) Area sampling  
 (C) Purposive sampling (D) Systematic sampling
36. Survey research methods come under  
 (A) Pre-empirical research methods (B) Descriptive research methods  
 (C) Experimental research methods (D) All of these
37. Ethical principle is available in which report  
 (A) Belmont Report (B) Finance report  
 (C) Research Report (D) None of these
38. The logic of induction is very much related with  
 (A) The logic of sampling (B) The logic of controlled variable  
 (C) The logic of observation (D) None of these
39. The aims of research  
 (A) are descriptive in nature (B) are founded on human values  
 (C) cause-effect-relatedness (D) All of these
40. Objective or unbiased observation is most vital in  
 (A) All walks of life (B) Performing experiments  
 (C) Normal behaviour (D) Research methods
41. Reliability of a research result implies its  
 (A) Verifiability (B) Validity  
 (C) Uniqueness (D) Usefulness
42. Watson and Mcgrath defined research as  
 (A) An intellectual exercise (B) Using exploratory methods  
 (C) Using scientific methods (D) None of these
43. A research is  
 (A) A serious and investigative study (B) Being illuminated  
 (C) Based on standardized conclusions (D) All of these
44. Action research is a type of  
 (A) Applied research (B) Quality research  
 (C) Working research (D) Survey research
45. Which of the following is the key factor in determining the success of group research?  
 (A) People (B) Organization (C) Researcher (D) Creativity
46. Which of the following have a direct bearing on research tools and techniques?  
 (A) Concepts (B) Knowledge (C) Aspirations (D) Processes

47. The evolution of operation research could be associated within well-known development of  
(A) Industrial organization (B) Institutional organization  
(C) Small scale organization (D) Traditional organization
48. Which of the following has a great impact mind of the researcher?  
(A) References (B) Finance (C) Journals (D) Library
49. Which of the following is the first step in a research process?  
(A) Selecting a topic (B) Formulating research problem  
(C) Development of a hypothesis (D) None of the above
50. Which of the following is an way of doing social science research?  
(A) Case study (B) Game study (C) Plan study (D) Process study

x-x-x

## Industrial Chemistry(Ph.D)

- Which of the following is an autocatalytic reaction?  
(A) Photochemical reactions (B) Microbial fermentation reaction  
(C) Enzyme fermentation reaction (D) Ammonia synthesis reaction
- In a reversible chemical reaction having two reactants in equilibrium, if the concentration of the reactants is doubled, then the equilibrium constant will  
(A) Remain the same (B) Be halved  
(C) Also be doubled (D) Become one fourth
- Grashoff number is defined as the ratio of the  
(A) Buoyancy to inertial forces (B) Buoyancy to viscous forces  
(C) Inertial to viscous forces (D) Buoyancy to surface tension forces
- Absorptivity and reflectivity of a perfect black body are respectively  
(A) 1 and 0 (B) 0 and 1 (C) 1 and  $\infty$  (D) 0 and 0.5
- What is the Thiele modulus of the solid catalysed first order reaction as shown below,  
$$x \xrightarrow{k} y$$
if the pore diffusion offers negligible resistance to reaction?  
(A)  $< 5$  (B)  $< 0.5$  (C)  $> 1$  (D) 5
- If in the gaseous phase reaction,  $N_2O_4 \rightleftharpoons 2NO_2$ ,  $x$  is the part of  $N_2O_4$  which dissociates, then the number of molecules at equilibrium will be  
(A)  $(1 + x)$  (B)  $(1 - x)$  (C)  $(1 + x)^2$  (D)  $(1 - x)^2$
- The feed to fractionating column is changed from saturated vapour to saturated liquid. If the separation and reflux ratio remains unchanged, the number of ideal stages will  
(A) Increase  
(B) Decrease  
(C) Remains same  
(D) Depend on saturated boiling point; may increase or decrease
- Dry bulb temperature of the gas is \_\_\_\_\_ the wet bulb temperature.  
(A) less than (B) more than (C) equal to (D) none of these
- Back-trapping in a distillation column  
(A) Increases tray efficiency  
(B) Decreases tray efficiency  
(C) Reduces pressure drop  
(D) Is desirable, as it provides improved vapour-liquid contact
- For organic compounds, group contribution method can be used for the estimation of  
(A) Critical properties (B) Specific gravity  
(C) Specific volume (D) Thermal conductivity

11. When liquid and vapour phases of one component system are in equilibrium (at a given temperature and pressure), the molar free energy is  
 (A) More in vapour phase  
 (B) More in liquid phase  
 (C) Same in both the phases  
 (D) Replaced by chemical potential which is more in vapour phase
12. The ground state energy of H-atom is 13.6eV. The energy needed to ionize H-atom from its second excited state is:  
 (A) 1.51 eV (B) 3.4 eV (C) 13.6 eV (D) 12.1 eV
13. Iodine-131 is a radioactive isotope with a half-life of 8 days. How many grams of a 64 g sample of iodine-131 will remain at the end of 24 days?  
 (A) 12 g (B) 32 g (C) 28 g (D) 8 g
14. Combustion of pulverised coal as compared to that of lump coal  
 (A) Develops a non-luminous flame (B) Develops a low temperature flame  
 (C) Can be done with less excess air (D) Provides a lower rate of heat release
15. Low temperature carbonisation of coal takes place at \_\_\_\_\_ °C.  
 (A) 300 (B) 1100 (C) 700 (D) 400
16. Thermosetting plastic materials  
 (A) Can be repeatedly melted (B) Is useful for melt casting  
 (C) Cannot be melted after forming (D) Is useful for spinning
17. Neoprene is chemically known as  
 (A) Polybutadiene (B) Styrene Butadiene Rubber (SBR)  
 (C) Polyurethane (D) Poly chloroprene
18. Fresh water carrying pipelines in chemical industries are coloured with \_\_\_\_\_ colour.  
 (A) Sea green (B) Brown (C) Yellow (D) Red
19. The ratio of shear stress to shear strain is called  
 (A) Bulk modulus (B) Shear modulus  
 (C) Modulus of rigidity (D) Modulus of elasticity
20. Hot blast main (carrying air at 1000°C) in blast furnace are lined with \_\_\_\_\_ bricks.  
 (A) Silica (B) Fireclay (C) Magnesite (D) Zirconia
21. Persons working in cement plants and limestone quarries are more prone to disease like  
 (A) Cancer (B) Asthma  
 (C) Silicosis (D) Fluorosis (bone disease)
22. Particulates (< 1µm size) remaining suspended in air indefinitely and transported by wind currents are called  
 (A) Fumes (B) Mists (C) Smoke (D) Aerosols

23. In water treatment, alum[Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>] is used for the process of  
 (A) Filtration (B) Coagulation (C) Sedimentation (D) Disinfection
24. Direct costs component of the fixed capital consists of  
 (A) Contingencies (B) Onsite and offsite costs  
 (C) Labour costs (D) Raw material costs
25. The behaviour of visco-elastic material is time dependent. This behaviour is common in \_\_\_\_\_ materials.  
 (A) non-crystalline solid (B) crystalline  
 (C) rubbery (D) non-crystalline organic polymeric
26. Which of the following is universally employed as the low expansion metal in the bimetallic thermometer, which is an iron-nickel alloy containing 36% nickel and has very low co-efficient of expansion (1/20th of ordinary metals) ?  
 (A) Constantan (B) Alumel (C) Invar (D) Chromel
27. Oxidation of SO<sub>2</sub> to SO<sub>3</sub> is favoured by  
 (A) Low temperature and low pressure (B) Low temperature and high pressure  
 (C) High temperature and low pressure (D) High temperature and high pressure
28. Catalyst used in alkylation process is  
 (A) Sulphuric acid (B) Nickel (C) Silica gel (D) Alumina
29. Iso-octane is used as a reference substance in the definition of octane number and it is assigned an octane number value of 100. Iso-octane is chemically known as  
 (A) α-methyl naphthalene (B) 2,2,4-tri methyl pentane  
 (C) 1, 3 butadiene (D) tetra methyl ethylene
30. Short distance transportation of grain, gravel, sand, ash, asphalt etc. is done by using a \_\_\_\_\_ conveyor.  
 (A) Flight (B) Slat or drag (C) Ribbon (D) Screw
31. Research conducted to find solution to an immediate problem is  
 (A) Fundamental research (B) Analytical  
 (C) Survey (D) Action research
32. Which of the following is common in all true experimental and Quasi experimental designs?  
 (A) Control group (B) Randomization  
 (C) Pre-testing and post-testing (D) Pre-testing
33. In which method of research an independent variable is manipulated with an intent to observe concomitant changes in dependent variable?  
 (A) ExPost Facto method (B) Case Study method  
 (C) Descriptive Survey Method (D) Experimental method
34. The term “research methodology” refers to;  
 (A) Methods used in data collection and analysis  
 (B) Rules for writing a resrcah report or paper  
 (C) Specific method of study and analysis  
 (D) The theoretical paradigms for data collection, analysis and interpretation

35. In which of the following there is greater flexibility in both the methods and process of research
- (A) Ethnography and phenomenology
  - (B) Descriptive survey and impact studies
  - (C) Experimental and observation based studies
  - (D) ExPost Facto and historical studies
36. Which of the following methods is used in empirical researches?
- (A) Inductive method
  - (B) Deductive method
  - (C) Initiative method
  - (D) Scientific method
37. A hypothesis is a
- (A) Tentative statement whose validity is still to be tested
  - (B) Supposition which is based on the past experiences
  - (C) Statement of fact
  - (D) Any false statement
38. What do you mean by synopsis of a research project?
- (A) The blue print of research
  - (B) Extracts from the research observations
  - (C) A plan of the research
  - (D) Summary of the findings of the research
39. What do you mean by an assumption?
- (A) It is a framework in which research work has to be done
  - (B) It simplifies the logical process of arriving at the solution
  - (C) It is a restrictive condition
  - (D) A vague statement
40. A null hypothesis is
- (A) Hypothesis of no difference
  - (B) Hypothesis that assigns value of zero to the variable
  - (C) Hypothesis of zero significance
  - (D) None of these
41. In case of destructive testing, the best method of research is
- (A) Sampling
  - (B) Complete enumeration
  - (C) Census survey
  - (D) None of these
42. Which of the following is a non-probability sampling method?
- (A) Simple random sampling
  - (B) Systematic sampling
  - (C) Cluster sampling
  - (D) Quota sampling
43. In which of the following cases, the formation of hypothesis may not be necessary?
- (A) Investigative historical studies
  - (B) Experimental studies
  - (C) Normative studies
  - (D) Survey studies
44. Who put forward the statement, "Research is an honest effort carried out through insight"?
- (A) Watson
  - (B) Binet
  - (C) Best
  - (D) Cook

45. Longitudinal approach of Research deals with  
(A) Short-term researches (B) Long-term researches  
(C) Horizontal researches (D) None of these
46. Which of the following is the first step in a research process?  
(A) Selecting a topic (B) Formulating research problem  
(C) Development of a hypothesis (D) None of these
47. In order to study the relationship of family size to income a researcher classifies his population into different income slabs and then takes a random sample from each slab. Which technique of sampling does he adopt?  
(A) Cluster sampling (B) Random sampling  
(C) Stratified random sampling (D) Systematic sampling
48. A researcher uses statistical techniques in his problem to confirm  
(A) Whether worthwhile inferences could be drawn  
(B) Whether the data could be quantified  
(C) Whether appropriate statistical techniques are available  
(D) Whether analysis of data would be possible
49. Dramaturgical interviewing is a technique of doing research by  
(A) Case study (B) Role playing (C) Planning (D) Sampling
50. Which of the following is the goal of evaluation research?  
(A) Situation-based decision making (B) People-based decision making  
(C) Data-based decision making (D) Trend-based decision making

## Information Technology Engineering(Ph.D.)

1. Which of the following is generally used to reduce the memory access time in computer architecture?  
(A) SDRAM's (B) Higher capacity RAM's  
(C) Heaps (D) Cache's
2. Which layer is used for wireless connection in IoT devices?  
(A) Application layer (B) Network layer  
(C) Data link layer (D) Transport layer
3. Full form of CISC is \_\_\_\_\_  
(A) Complex Instruction Sequential Compilation  
(B) Complete Instruction Sequential Compilation  
(C) Complex Instruction Set Computer  
(D) Computer Integrated Sequential Compiler
4. In the compilers, the keywords of any language can be recognized during the:  
(A) Code generation (B) Program's lexical analysis  
(C) Program's parsing (D) Dataflow analysis
5. An optical fiber is made up of \_\_\_\_\_ material  
(A) Glass (B) Plastic (C) Glass or plastic (D) Copper
6. What does LTE stands for?  
(A) Level Telecom Advanced (B) Long Terminal Advanced  
(C) Long Term Evolution (D) Long Time Evolution
7. In Mobile communication, the standard shape of cell is  
(A) Circular (B) Hexagonal (C) Triangular (D) No shape
8. Which of the following data structure is used for testing a palindrome?  
(A) Heap (B) Tree (C) Priority queue (D) Stack
9. Of the following, choose the property that is NOT for the XOR lists.  
(A)  $X \oplus 0 = X$  (B)  $X \oplus X = 0$   
(C)  $X \oplus 0 = 1$  (D)  $(X \oplus Y) \oplus Z = X \oplus (Y \oplus Z)$

10. In Bubble sort, the total number of comparisons are:  
(A)  $O(\log n)$  (B)  $O(n \log n)$  (C)  $O(2n)$  (D)  $O(n^2)$
11. Which of the following data structure is linear type?  
(A) Array (B) Tree (C) Graphs (D) Hierarchy
12. The expression  $c = i++$  causes  
(A) The value of  $i$  assigned to  $c$  and then  $i$  incremented by 1  
(B)  $i$  to be incremented by 1 and then the value of  $i$  assigned to  $c$   
(C) Value of  $i$  assigned to  $c$   
(D)  $i$  to be incremented by 1
13. Choose the languages which are used in data science.  
(A) C++ (B) C (C) R (D) Ruby
14. How is the 3rd element in an array accessed based on pointer notation?  
(A)  $*a+3$  (B)  $*(a+3)$  (C)  $**a+3$  (D)  $\&(a+3)$
15. The instruction, MOV AX, 1234H is an example of immediate addressing mode.  
(A) Register addressing mode (B) Immediate addressing mode  
(C) Based indexed addressing mode (D) Direct addressing mode
16. You are given reviews of few Amazon Prime webseries marked as positive, negative and neutral. Classifying reviews of a new Amazon prime Webseries is an example of:  
(A) Supervised learning (B) Unsupervised learning  
(C) Semisupervised learning (D) Reinforcement learning
17. Clustering and Classification are:  
(A) Unsupervised learning, Supervised learning  
(B) Unsupervised learning, Unsupervised learning  
(C) Supervised learning, Supervised learning  
(D) Supervised learning, Unsupervised learning
18. Which of the following is not a cybercrime?  
(A) Denial of Service (B) Man in the Middle  
(C) Malware (D) AES
19. A \_\_\_\_\_ can be a hardware device or a software program that filters all the packets of data that comes through a network, the internet, etc.  
(A) Firewall (B) Antivirus (C) Malware (D) Cookies

20. Which of the following color possess the longest wavelength in the visible spectrum?  
(A) Yellow                      (B) Red                      (C) Blue                      (D) Violet
21. .... is the first step in Image Processing is:  
(A) Segmentation                      (B) Image acquisition  
(C) Image enhancement                      (D) Image restoration
22. How many select lines would be required for an 8-line-to- 1-line multiplexer?  
(A) 2                      (B) 3                      (C) 4                      (D) 8
23. When J=..... and K= ....., the JK flipflop become T-flip flop  
(A) 0,0                      (B) 0,1                      (C) 1,0                      (D) 1,1
24. How many address bits are required to select memory locations of 4KB memory?  
(A) 4                      (B) 8                      (C) 12                      (D) 16
25. If a program contains a void function named *displayName*, such that it requires no formal parameters. Tick the correct function prototype for this function.  
(A) `displayName;`                      (B) `displayName(void);`  
(C) `void displayName;`                      (D) `void displayName();`
26. Which among the following is the benefit of using simple random sampling?  
(A) The results are always representative  
(B) Interviewers can choose respondents freely  
(C) Informants can refuse to participate  
(D) We can calculate the accuracy of the results
27. The term 'hypothesis' can be understood as:  
(A) Tentative statement whose validity is still to be tested  
(B) Supposition which is based on the past experiences  
(C) Statement of fact  
(D) Definite statement which is confirmed
28. For a frequency distribution of a variable x, mean is 32, median is 30. The distribution is:  
(A) Positively skewed  
(B) Negatively Skewed  
(C) Can be either positively skewed or negatively skewed

(D) Can't say whether positively skewed or negatively skewed due to lack of information

**29.** What do you mean by synopsis of a research project?

- (A) The blue print of research                      (B) Extracts from the research observations  
(C) A plan of the research                          (D) Summary of the findings of the research

**30.** A null hypothesis is

- (A) Hypothesis of no difference  
(B) Hypothesis that assigns value of zero to the variable  
(C) Hypothesis of zero significance  
(D) Hypothesis which gives no result

**31.** Type-1 Error occurs when

- (A) The null hypothesis is rejected even when it is true  
(B) The null hypothesis is accepted even when it is false  
(C) The null hypothesis as well as Alternative hypothesis, both are rejected  
(D) The null hypothesis is rejected as it is false

**32.** For a parameter whose value is unknown, the belief or claim for that parameter is classified as:

- (A) Parameter claim testing                      (B) Hypothesis testing  
(C) Expected belief testing                      (D) Primary limit testing

**33.** If a person buys a lottery, the chance of winning an Amount A is 60%, the chance of winning an Amount B is 70% and the chance of winning both is 40%, then the chance of winning an Amount A or Amount B is:

- (A) 0.6              (B) 0.9              (C) 0.8              (D) 0.5

**34.** The format of thesis writing is the same as in

- (A) Writing of Seminar representation              (B) Preparation of research paper/article  
(C) A research dissertation                          (D) Presenting a workshop/conference paper

**35.** Which one among the following statement is true in the context of the testing of hypotheses?

- (A) It is only the alternative hypotheses that can be tested  
(B) It is only the null hypotheses that can be tested

- (C) Both the alternative and the null hypotheses can be tested
- (D) Both the alternative and the null hypotheses cannot be tested

**36.** The largest value is 60 and the smallest value is 40 and the number of classes desired is 5, then the class interval is

- (A) 4
- (B) 15
- (C) 20
- (D) 25

**37.** Which is not the characteristic of research

- (A) Basic Research
- (B) Holistic Perspective
- (C) Context Sensitivity
- (D) Ex-Post Facto Research

**38.** What does the longitudinal research approach actually deal with?

- (A) Long-term research
- (B) Short-term research
- (C) Horizontal research
- (D) Vertical research

**39.** A t-test is a significance test that assesses

- (A) The means of two independent groups
- (B) The medians of two dependent groups
- (C) The modes of two independent variables
- (D) The standard deviation of three independent variables

**40.** The upper and lower boundaries of interval of confidence are classified as

- (A) Confidence limits
- (B) Marginal limits
- (C) Estimate limits
- (D) Error biased limits

**41.** How to judge the depth of any research?

- (A) By research title
- (B) By research duration
- (C) By research objectives
- (D) By total expenditure on research

**42.** Find the mode of the call received on 7 consecutive day 11,13,13,17,17,17,19,23,25

- (A) 11
- (B) 13
- (C) 17
- (D) 23

**43.** Which level of measurement has a zero point of origin?

- (A) Nominal
- (B) Ratio
- (C) Ordinal
- (D) Interval

**44.** Suppose a person has 8 red, 5 green, 12 orange, and 15 blue balls. Test the null hypothesis that the colors of the balls occur with equal frequency. What is the Chi Square value you get?

- (A) 5.6
- (B) 5.68
- (C) 5.86
- (D) 5.8

**45.** Which of these distributions is used for a testing hypothesis?

- (A) Normal Distribution
- (B) Chi-Squared Distribution

(C) Gamma Distribution

(D) Poisson Distribution

46. In which scale of measurement, classification, order and equality of units are ensured?

(A) Ordinal Scale

(B) Nominal Scale

(C) Interval Scale

(D) Ratio Scale

47. If the calculated Chi-value is greater than the critical Chi-value, then

(A) Reject Null hypothesis

(B) Accept Null hypothesis

(C) Estimate again

(D) Do nothing

48. Statement 1: *Deductive method begins* with general premises and through logical argument, comes to a specific conclusion.

Statement 2. *Inductive method* starts from specific observations which then leads to a general conclusion.

(A) Statement 1 is True, Statement 2 is False

(B) Statement 1 is True, Statement 2 is True

(C) Statement 1 is False, Statement 2 is True

(D) Statement 1 is False, Statement 2 is False

49. If the standard deviation of a data is 0.012. Find the variance.

(A) 0.144

(B) 0.00144

(C) 0.000144

(D) 0.0000144

50. \_\_\_\_\_ is not a measure of central tendency.

(A) Mode

(B) Mean

(C) Median

(D) Range

x-x-x

**Mechanical Engineering(Ph.D.)**

1. The product from blast furnace is called  
(A) Cast Iron                      (B) Wrought Iron                      (C) Pig Iron                      (D) Steel
2. The limiting frictional force is  
(A) Equal to the applied force                      (B) More than that of the applied force  
(C) Less than that of the applied force                      (D) Unpredictable
3. A planar closed kinematic chain is formed with rigid links  $PQ = 2.0\text{m}$ ,  $QR = 3.0\text{m}$ ,  $RS = 2.5\text{m}$  and  $SP = 2.7\text{m}$  with all revolute joints. The link to be fixed to obtain a double rocker (rocker-rocker) mechanism is  
(A) PQ                      (B) QR                      (C) RS                      (D) SP
4. A shaft is subjected to torsion when  
(A) Torque is applied at its one end  
(B) Equal torques are applied at its two ends  
(C) Equal and opposite torques applied at its two ends  
(D) None of the above
5. If a bar of length,  $l$ , cross-sectional area,  $A$ , weighing,  $W$  is fixed vertically at its upper end, its elongation is equal to  
(A)  $Wl/2AE$     (B)  $Wl/AE$     (C)  $2AE/2Wl$     (D)  $AE/Wl$
6. In involute gears, the pressure angle  
(A) Dependent on the size of teeth                      (B) Dependent on the size of gears  
(C) Always constant                      (D) Always variable
7. The mean kinetic energy of a flywheel is equal to  
(A)  $I\omega^2$                       (B)  $I\omega^2/2g$                       (C)  $I\omega^2/2$                       (D)  $I\omega^2/4$
8. Which is closest to the purest form of the iron  
(A) Cast Iron                      (B) Wrought Iron  
(C) Pig Iron                      (D) Steel
9. The efficiency of Diesel cycle with decrease in cut off  
(A) Increases                      (B) Decreases  
(C) Remains unaffected                      (D) First increases and then decreases
10. BHP of an engine is determined by a formula  
(A)  $2\pi NT/4500$                       (B)  $4\pi NT/4500$                       (C)  $\pi NT/4500$                       (D)  $2\pi RNT/4500$
11. Turbo propeller has the following additional feature over the turbojet  
(A) Propeller                      (B) Diffuser  
(C) Intercooler                      (D) Turbine and combustion chamber

12. Emissivity of a white polished body in comparison to a black body is  
 (A) Higher (B) Lower  
 (C) Same (D) Depends upon the shape of body
13. In terms of theoretical stress concentration factor ( $K_t$ ) and fatigue stress concentration factor ( $K_f$ ), the notch sensitivity 'q' is expressed as  
 (A)  $(K_f - 1) (K_t - 1)$  (B)  $(K_f - 1) (K_t + 1)$   
 (C)  $(K_t - 1) (K_f - 1)$  (D)  $(K_f + 1) (K_t + 1)$
14. PERT has following time estimate  
 (A) One time estimate (B) Two time estimate  
 (C) Three time estimate (D) Four time estimate
15. If the body is at thermal equilibrium, then the  
 (A) Emissivity = absorptivity (B) Emissivity > absorptivity  
 (C) Emissivity < absorptivity (D) None of these
16. It is desired to measure the Young's modulus and the Poisson's ratio of a given homogeneous, isotropic material. A bar of length 20cm and square cross section 10mm x 10 mm of this material is subjected to a tensile load of 40kN. Under this load, length increases to 20.1 cm while the cross-section reduces to 9.98mm x 9.98mm. Young's modulus and Poisson's ratio of the material are:  
 (A) 80 GPa and 0.4 respectively (B) 40 GPa and -0.4 respectively  
 (C) 80 GPa and -0.2 respectively (D) 40 GPa and 0.2 respectively
17. The dry bulb temperature lines of psychrometric chart are  
 (A) Vertical (B) Horizontal (C) Inclined (D) Curved
18. The resultant upward pressure of a fluid on a floating body is equal to the weight of the fluid displaced by the body. This definition is according to  
 (A) Buoyancy (B) Equilibrium of a floating body  
 (C) Archimedes' principle (D) Bernoulli's theorem
19. In a spring mass system, the mass of the system is made half and the spring stiffness is doubled. The natural frequency of longitudinal vibrations  
 (A) is halved (B) is doubled  
 (C) is quadrupled (D) remains unaffected
20. A vibrating machine is isolated from the floor using springs. If the ratio of excitation frequency of vibration of machine to the natural frequency of the isolation system is equal to 0.5, then transmissibility ratio of isolation is  
 (A) 1/2 (B) 3/4 (C) 4/3 (D) 2
21. The meaning of 'Payoffs' in Game Theory is  
 (A) Outcome of a game when different alternatives are adopted by players  
 (B) No. of players involved in a game  
 (C) Value of a game



31. In a rolling process, the state of stress of the material undergoing deformation is  
 (A) Pure compression (B) Pure shear  
 (C) Compression and shear (D) Tension and shear
32. Which of the following statements are FALSE about the buoyancy of an object?  
 (A) The force of buoyancy on a ship is equal to the weight of the water displaced by the ship and its cargo  
 (B) Buoyancy explains why it is easier to lift an object in water than it is in air  
 (C) A solid object with a density 60 percent that of water will have 40 percent of its total volume above the water line as it floats  
 (D) An object only has buoyancy in liquids
33. According to distortion-energy criterion, yielding occurs when  
 (A) Distortion energy reaches a critical value  
 (B) Second invariant of the stress deviator exceeded some critical value  
 (C) Octahedral shear stress reaches a critical value  
 (D) All of these
34. The basic difference between PERT and CPM is that  
 (A) PERT deals with events and CPM with activities  
 (B) Critical path is determined in PERT only  
 (C) Costs are considered on CPM only and not in PERT  
 (D) Guessed times are used in PERT and evaluated times in CPM
35. Supercharging is the process of  
 (A) Supplying the intake of an engine with air at a density greater than the density of the surrounding atmosphere  
 (B) Providing forced cooling air  
 (C) Injecting excess fuel for raising more load  
 (D) Supplying compressed air to remove combustion products fully
36. A steel rod of diameter 1 cm and 1 m long is heated from 20°C to 120°C. Its  $\alpha = 12 \times 10^{-6} / \text{K}$  and  $E = 200 \text{ GN/m}^2$ . If the rod is free to expand, the thermal stress developed in it is:  
 (A)  $12 \times 10^4 \text{ N/m}^2$  (B)  $240 \text{ KN/m}^2$  (C) Zero (D) Infinity
37. A test specimen is stressed slightly beyond the yield point and then unloaded. Its yield strength will:  
 (A) Decrease (B) Increase  
 (C) Remains same (D) Becomes equal to ultimate tensile strength
38. A thin walled spherical shell is subjected to an internal pressure. If the radius of the shell is increased by 1% and the thickness is reduced by 1%, with the internal pressure remaining the same, the percentage change in the circumferential (hoop) stress is  
 (A) 0 (B) 1 (C) 1.08 (D) 2.02
39. At the point of boundary layer separation  
 (A) Shear stress is maximum (B) Shear stress is Zero  
 (C) Velocity is negative (D) Density variation is maximum

40. The thickness of thermal and hydrodynamic layers are equal if  
 (A)  $Pr = 1$                       (B)  $Pr > 1$                       (C)  $Pr < 1$                       (D)  $Pr = Nu$   
 $Pr = \text{Prandtl Number}$   
 $Nu = \text{Nusselt Number}$
41. In a double pipe counter flow heat exchanger if  $m_h c_h = m_c c_c$  the temperature profiles of the two fluid along its length is  
 (A) Paraboli                                      (B) Cubic  
 (C) Parallel straight line                      (D) Exponential
42. Mean, Median and Mode are:  
 (A) Measures of deviation                      (B) Ways of sampling  
 (C) Measures of control tendency                      (D) None of these
43. Research is  
 (A) Searching again and again  
 (B) Finding solution to any problem  
 (C) Working in a scientific way to search for truth of any problem  
 (D) None of the above
44. Which of the following is the first step in starting the research process?  
 (A) Searching sources of information to locate problem  
 (B) Survey of related literature  
 (C) Identification of problem  
 (D) Searching for solutions to the problem
45. A common test in research demands much priority on  
 (A) Reliability                      (B) Useability                      (C) Objectivity                      (D) All of these
46. Action research means  
 (A) A longitudinal research  
 (B) An applied research  
 (C) A research initiated to solve an immediate problem  
 (D) A research with socioeconomic objective
47. A reasoning where we start with certain particular statements and conclude with a universal statement is called  
 (A) Deductive Reasoning                      (B) Inductive Reasoning  
 (C) Abnormal Reasoning                      (D) Transcendental Reasoning
48. Which of the following variables cannot be expressed in quantitative terms?  
 (A) Socio-economic Status                      (B) Marital Status  
 (C) Numerical Aptitude                      (D) Professional Attitude
49. The essential qualities of a researcher are  
 (A) Spirit of free enquiry  
 (B) Reliance on observation and evidence  
 (C) Systematization or theorizing of knowledge  
 (D) All the above

50. In the process of conducting research “Formulation of Hypothesis” is followed by
- (A) Statement of Objectives
  - (B) Analysis of Data
  - (C) Selection of Research Tools
  - (D) Collection of Data

*x-x-x*

(5)

054, 117

Question Booklet Series: **A**

Question Booklet Serial No.: **220011**

### Ph.D. Entrance Test : 2022

**Subject: Electrical & Electronics Engineering/ Electrical Engineering  
Paper – I**

**Important:** Please consult your Admit Card/Roll No. slip before filling your Roll Number on the Test Booklet and Answer Sheet.

Roll No.

(In Figure)

(In Words)

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O.M.R. Answer Sheet Serial No.

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Signature of Candidate: \_\_\_\_\_

Signature of Invigilator: \_\_\_\_\_

Time: 60 Minutes

Number of Questions: 50

Maximum Marks: 50

**DO NOT OPEN THE SEAL ON THE BOOKLET UNTIL ASKED TO DO SO.**

#### **INSTRUCTIONS:**

1. Write your Roll No. on the Questions Booklet and also on the OMR Answer Sheet in the space provided and nowhere else.
2. Enter the Question Booklet Serial No. on the OMR Answer Sheet. Darken the corresponding bubbles with **Black Gel Pen**.
3. Do not make any identification mark on the Answer Sheet or Question Booklet.
4. Please check that this Question Booklet contains **50** Questions. In case of any discrepancy, inform the Assistant Superintendent within 10 minutes of the start of Test.
5. Each question has four alternative answer (A,B,C,D) of which only one is correct. For each question, darken only one bubble (A or B or C or D), whichever you think is the correct answer, on the Answer Sheet with **Black Gel Pen. There shall be no negative marking.**
6. If you do not want to answer a question, leave all the bubbles corresponding to that question blank in the Answer Booklet. No marks will be deducted in such cases.
7. **20 minutes Extra** would be given to the **visually handicapped/PwD Candidates**.
8. **Darken** the bubbles in the OMR Answer Sheet according to the Serial No. of the question given in the Question Booklet.
9. If you want to change an already marked answer, erase the shade in the darkened bubble completely.
10. For rough work only the blank sheet at the end of the Question Booklet be used.
11. The University will provide Logarithmic table. Borrowing of log table or other material is not allowed.
12. The Answer Sheet is designed for computer evaluation. Therefore, if you do not follow the instructions given on the Answer Sheet, it may make evaluation by the computer difficult. **Any resultant loss to the candidate on the above account, i.e. not following the instructions completely, shall be of the candidate only.**
13. After the test, hand over the Question Booklet and the Answer Sheet to the Assistant Superintendent on duty.
14. In no case the Answer Sheet, the Question Booklet, or its part or any material copied/noted from this Booklet is to be taken out of the examination hall. Any candidate found doing so would be expelled from the examination.
15. A candidate who creates disturbance of any kind or changes his/her seat or is found in possession of any paper possibly of any assistant or found giving or receiving assistant or found using any other unfair means during the examination will be expelled from the examination by the Centre Superintendent/Observer whose decision shall be final.
16. **Communication equipment such as mobile phones, pager, wireless set, scanner, camera or any electronic/digital gadget etc., is not permitted inside the examination hall. Use of calculators is not allowed.**
17. The candidates will not be allowed to leave the Examination Hall/Room before the expiry of the allotted time.

(EEE/EE)

1. When an abstract should be written in report?
  - (A) After writing the introduction.
  - (B) Before the introduction and after the title.
  - (C) After attaining the results.
  - (D) After the main body of the report has been drafted.
2. Dependent variable in an experimental design is the one which is:
  - (A) Not manipulated and in which any changes are observed.
  - (B) Manipulated in order to observe any effects on the other.
  - (C) Dependent upon parameters of case study.
  - (D) It's meaning depends on how it is defined.
3. A researcher surveyed 7013 people and asked about their favorite political party. They were supposed to select one out of four political parties. How should the researcher analyze this data?
  - (A) t-test
  - (B) One-way analysis of variance
  - (C) Chi-square test
  - (D) Regression
4. A Hypothesis used in research process contributes to the development of \_\_\_\_\_.
  - (A) Theory
  - (B) Generalization
  - (C) Evolution
  - (D) Concept
5. The strongest tool to determine the stability and the transient response of the system is
  - (A) Roth-Hurwitz criterion
  - (B) Bode plot
  - (C) Root Locus
  - (D) Nyquist Plot
6. The major cause of the voltage sag in system is
  - (A) Malfunction of primary component
  - (B) Equipment failure
  - (C) Starting of large induction motor
  - (D) All of the above

7. Which of these two entities are not present in vertically integrated electrical utility structure as compared to the deregulated electricity utility structure?
- (A) Generation and distribution
  - (B) Consumer and transmission
  - (C) ISO and market trader
  - (D) Transmission and distribution
8. \_\_\_\_\_ is a power exchange in India.
- (A) IEX
  - (B) NLDC
  - (C) RLDC
  - (D) CERC
9. Sphere gap is used for the measurement of
- (A) a.c. voltage only
  - (B) d.c. voltage only
  - (C) Impulse voltage of any wave shape
  - (D) a.c. voltage and d.c. voltage
10. Standard value of the reactance of transmission line per km is assumed to be \_\_\_\_\_ for 400kV.
- (A)  $0.327 \Omega$
  - (B)  $1.327 \Omega$
  - (C) Infinite  $\Omega$
  - (D) Zero  $\Omega$
11. An alternator is an example of \_\_\_\_\_.
- (A) Single-excited magnetic system
  - (B) Multiply-excited electric system
  - (C) Multiply-excited magnetic system
  - (D) Singly-excited electric system
12. A 200/100 V, 50 Hz transformer is to be excited at 40 Hz from the 100V side. For the exciting current remain the same, the applied voltage should be
- (A) 150 V
  - (B) 80 V
  - (C) 125 V
  - (D) 100 V

13. In a generating synchronous machine carrying load:

- (A)  $E_f$  leads  $V_t$  by angle delta
- (B)  $E_f$  lags  $V_t$  by angle delta
- (C)  $E_f$  and  $V_t$  are in phase
- (D)  $E_f$  and  $V_t$  are in phase opposition

14. The power input to an induction motor is 40 kW when it is running at 5% slip. The stator resistance and core loss are assumed negligible. The torque developed in synchronous watts is

- (A) 42 kW
- (B) 40 kW
- (C) 38 kW
- (D) 2 kW

15. A dc circuit shown in Fig. 1 has a voltage  $V$ , a current source  $I$  and several resistors. A particular resistor  $R$  dissipates a power of 4 W when  $V$  alone is active. The same resistor dissipates a power of 9 W when  $I$  alone is active. The power dissipated by  $R$  when both sources are active will be

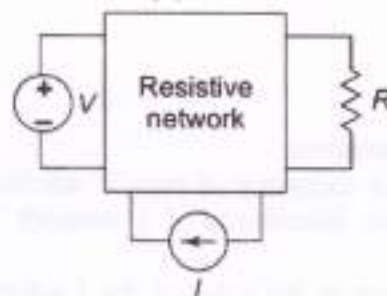


Fig. 1

- (A) 1 W
- (B) 5 W
- (C) 13 W
- (D) 25 W

16. The ratio of the readings of two wattmeters connected to measure power in a balanced 3-phase load is 5:3 and the load is inductive. The power factor of the load is

- (A) 0.917 lead
- (B) 0.917 lag
- (C) 0.6 lead
- (D) 0.6 lag

17. For a star-connected load, the line currents are unbalanced and  $I_a$ ,  $I_b$  and  $I_c$  are equal to  $-j10$ ,  $-j10$  and  $-j20$  ampere respectively. The neutral current will be equal to

- (A)  $+8.66 + j5$   
 (B)  $+8.66 - j5$   
 (C)  $-8.66 - j5$   
 (D)  $-8.66 + j5$

18. For the three-phase circuit shown in Fig.2, the ratio of the currents  $I_R : I_Y : I_B$  is given by

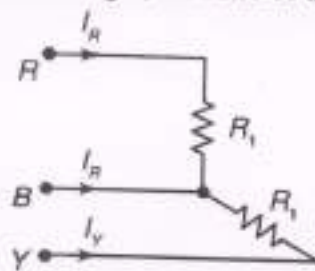


Fig. 2

- (A)  $1 : 1 : \sqrt{3}$   
 (B)  $1 : 1 : 2$   
 (C)  $1 : 1 : 0$   
 (D)  $1 : 1 : \sqrt{3}/2$

19. Consider the following statements:

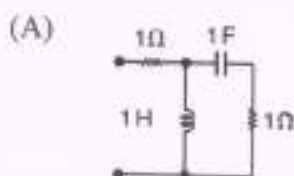
1. Transfer impedance is the reciprocal of transfer admittance.
2. One can derive transfer impedance of a network if its driving-point impedance and admittance are known.
3. Driving point impedance is the ratio of the Laplace transform of voltage and current functions at the input.

Of these statements,

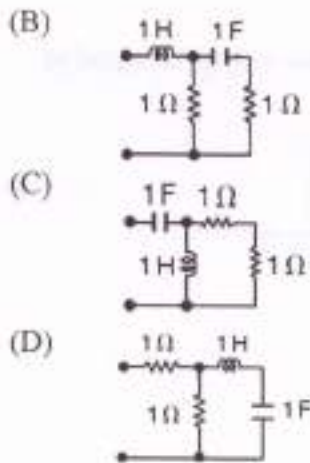
- (A) 1, 2 and 3 are correct  
 (B) 1 and 2 are correct  
 (C) 2 and 3 are correct  
 (D) 3 alone is correct

20. Which one of the following circuits has a driving-point impedance of

$$Z(s) = \frac{2(s^2 + s + \frac{1}{2})}{s^2 + s + 1} \quad ?$$



(4)



21. Consider the Bode magnitude plot shown in Fig. 3. The transfer function  $H(s)$  is

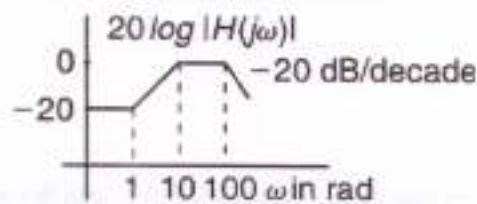


Fig. 3

- (A)  $\frac{(s+10)}{(s+1)(s+100)}$
- (B)  $\frac{10(s+1)}{(s+1)(s+100)}$
- (C)  $\frac{10^2(s+1)}{(s+10)(s+100)}$
- (D)  $\frac{10^2(s+100)}{(s+10)(s+10)}$

22. The poles and zeros of a driving point function of a network are simple and interlace on the negative real axis with a pole closest to the origin. It can be realized

- (A) by an LC network
- (B) as an RC driving point impedance
- (C) as an RC driving point admittance
- (D) only by an RLC network

23. For the triangular waveform shown in Fig. 4, the rms value of the voltage is equal to

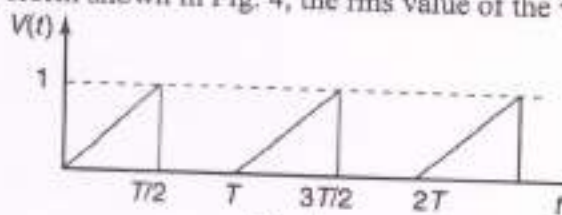


Fig. 4

- (A)  $\sqrt{\frac{1}{6}}$   
 (B)  $\sqrt{\frac{1}{3}}$   
 (C)  $\frac{1}{3}$   
 (D)  $\sqrt{\frac{2}{3}}$
24. For the network shown in Fig. 5, the parameters  $h_{11}$  and  $h_{21}$  are

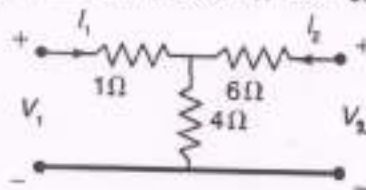


Fig. 5

- (A)  $5\Omega$  and  $-2/3 \Omega$   
 (B)  $3.4\Omega$  and  $-2/5 \Omega$   
 (C)  $3.4\Omega$  and  $-3/5 \Omega$   
 (D) none of the above
25. An alternator having induced emf. of 1.6 p.u. is connected to an infinite bus of 1.0 p.u. If the busbar has reactance of 0.6 p.u. and alternator has reactance of 0.2 p.u., the maximum power that can be transferred is given by
- (A) 8 p.u.  
 (B) 2 p.u.  
 (C) 2.67 p.u.  
 (D) 5.0 p.u.
26. If the normal system frequency is 50 Hz and if it is operating at 53 Hz, the equipment on the system most adversely affected is
- (A) Power transformer  
 (B) Alternator  
 (C) Turbine  
 (D) all the above are equally affected.

27. Storage time of a transistor is the time taken for the collector current to fall to
- 10 percent from maximum value
  - 20 percent to 80 percent from maximum value
  - 60 percent from maximum value
  - 90 percent from maximum value
28. If  $R = 1$  and  $S = 1$ , the output of RS flip-flop lies in
- transient state
  - race condition
  - triggered state
  - latched state
29. Binary 1000 will be the result of which of the following subtraction in binary system?
- $11111 - 1110$
  - $1011 - 1110$
  - $1111 - 111$
  - $1010 - 101$
30. In the circuit given in Fig. 6 the maximum value of the current through thyristors and TA can respectively be

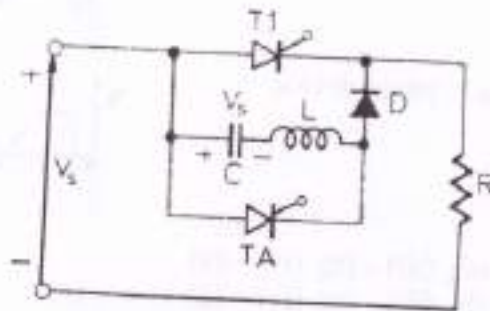


Fig. 6

- $\frac{V_s}{R}, \frac{V_s}{R} + V_s \sqrt{\frac{C}{L}}$
  - $\frac{V_s}{R} + V_s \sqrt{\frac{C}{L}}, V_s \sqrt{\frac{C}{L}}$
  - $V_s \sqrt{\frac{C}{L}}, \frac{V_s}{R}$
  - $\frac{V_s}{R}, V_s \sqrt{\frac{C}{L}}$
31. In dc choppers, the waveforms for input and output voltages are respectively
- Discontinuous, continuous
  - Both continuous
  - Both discontinuous
  - Continuous, discontinuous

32. A step up chopper has  $V_s$  as the source voltage and  $\alpha$  as the duty cycle. The output voltage for this chopper is given by

- (A)  $V_s(1 + \alpha)$
- (B)  $V_s/(1 - \alpha)$
- (C)  $V_s(1 - \alpha)$
- (D)  $V_s/(1 + \alpha)$

33.

(i) 1-phase to 1-phase with continuous conduction



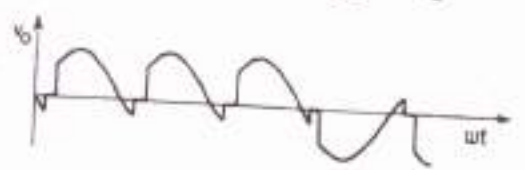
(ii) 1-phase to 1-phase with discontinuous conduction



(iii) Step-up device



(iv) 3-phase to 1-phase device



- (A) (i) - (c), (ii) - (d), (iii) - (a), (iv) - (b)
- (B) (i) - (a), (ii) - (b), (iii) - (c), (iv) - (d)
- (C) (i) - (c), (ii) - (a), (iii) - (b), (iv) - (d)
- (D) (i) - (a), (ii) - (c), (iii) - (d), (iv) - (b)

34. In Fig. 7 capacitor  $C$  is charged to  $V_0 = 50$  V with upper plate positive. Switch  $S$  is closed at  $t = 0$ . Current through the circuit at  $t = 0$  and final voltage across  $C$  are respectively,

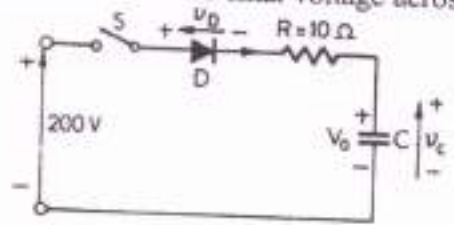


Fig. 7

- (A) 15 A, 200 V
- (B) 20 A, 200 V
- (C) 25 A, 250 V
- (D) 15 A, 150 V

35. Possible faults that may occur on a transmission line are
1. 3-phase fault
  2. L-L-G fault
  3. L-L fault
  4. L-G fault
- The decreasing order of severity of the fault from the stability point of view is :
- (A) 1-2-3-4
  - (B) 1-4-3-2
  - (C) 1-3-2-4
  - (D) 1-3-4-2
36. The power angle characteristic of machine-infinite bus system is  $P_e = 2 \sin \delta$  p.u. It is operating at  $\delta = 30^\circ$ . Which one of the following is the synchronizing power coefficient at the operating point?
- (A) 1.0
  - (B)  $\sqrt{3}$
  - (C) 2.0
  - (D)  $\frac{1}{\sqrt{3}}$
37. Increasing the transmission voltage double of its original value, the same power can be dispatched keeping the line loss
- (A) Equal to its original value
  - (B) Half of original value
  - (C) Double the original value
  - (D) One-fourth of original value
38. How many thyristors are required for getting sub-synchronous speed using a static Kramer drive system?
- (A) 48
  - (B) 12
  - (C) 6
  - (D) 18
39. The axis of pole around which field winding is wound is called
- (A) Horizontal axis
  - (B) d-axis
  - (C) q-axis
  - (D) Inter-polar axis

40. In a synchronous machine the effect of  $x_q''$  and  $x_d''$  is manifested only during
- Steady state condition
  - Transient condition
  - Sub-transient condition
  - Transient and sub-transient condition
41. Load frequency control is achieved by properly matching the individual machine's
- Reactive powers
  - Generated voltages
  - Turbine inputs
  - Turbine and generator ratings
42. A single phase full bridge diode rectifier delivers a load current of 10 A, which is ripple free. Average and rms values of diode currents are respectively
- 10 A, 7.07 A
  - 5 A, 10 A
  - 5 A, 7.07 A
  - 7.07 A, 5 A
43. A metal oxide varistor (MOV) is used for protecting
- Gate circuit against over-currents
  - Gate circuit against over-voltages
  - Anode circuit against over-currents
  - Anode circuit against over-voltages
44. In dc chopper, per unit ripple is maximum when duty cycle  $\alpha$  is
- 0.2
  - 0.5
  - 0.7
  - 0.9
45. Total harmonic distortion (THD) is defined as  
 Where  $I_s$  = rms value of supply phase current including fundamental and harmonics and  
 $I_{s1}$  = rms value of fundamental component of supply current.

|                                                    |                                                    |
|----------------------------------------------------|----------------------------------------------------|
| (A) $\sqrt{\frac{I_{s1}}{I_s} - 1}$                | (B) $\sqrt{\left(\frac{I_s}{I_{s1}}\right)^2 - 1}$ |
| (C) $\sqrt{\left(\frac{I_{or}}{I_s}\right)^2 - 1}$ | (D) $\frac{I_s}{I_{s1}}$                           |

(10)

46. The voltages of a generator and an infinite bus are given as  $0.92\angle 10^\circ$  and  $1.0\angle 0^\circ$  respectively. The generator acts as a
- Shunt coil
  - Shunt capacitor
  - The data is insufficient to judge
  - Series coil
47. When there is a change in load in a power station having a number of generator units operating in parallel, the system frequency is controlled by
- adjusting the steam input to the units
  - adjusting the field-excitation of the generators
  - changing the load divisions between the units
  - injecting reactive power at the station bus bar
48. The equation  $f(x)$  is given as  $x^2 - 4 = 0$ . Considering the initial approximation at  $x=6$  then the value of  $x^1$  is given as \_\_\_\_\_
- $10/3$
  - $4/3$
  - $7/3$
  - $13/3$
49. The zero sequence current of a generator for line to ground fault is  $j2.4$  p.u. Then the current through the neutral during the fault is
- $j2.4$  p.u.
  - $j0.8$  p.u.
  - $j7.2$  p.u.
  - $j0.24$  p.u.
50. In the network shown in Fig. 8, the switch 'S' is closed and a steady state is attained. If the switch is opened at  $t=0$ , then the current  $i(t)$  through the inductor will be

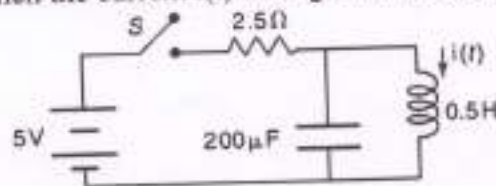


Fig. 8

- 2 A
- $\cos 50t$  A
- $2 \cos 100t$  A
- $2 \sin 50t$  A

x-x-x