Applied Science(Ph.D)

1. Which of the following is not an allotrope of carbon
A) Diamond B) Graphite C) Dendrimer D) Carbon nanotube

2. Which of the following cubic cells has maximum packing fraction
A) Simple Cubic Cell B) Body Centre Cubic Cell
C) Face Centre Cubic Cell D) Diamond Cubic Cell

3. Residual resistivity in metals owes its origin to
A) Zero-point energy of free electron gas
B) Presence of impurities/vacancies and defectsin the metal crystal
C) Different modes of lattice vibration in metal crystals
D) Minimum scattering of free electrons in metal crystals

4. Which of the following has highly –ve temperature coefficient of resistivity
A) Thermistor B) Conductor C) Insulator D) Transistor

5. In the polycrystalline structures, the grain boundaries can't be characterised by property that
A) Atomic packing is loose
B) Prone to diffusion and chemical activity
C) Form cleavage surfaces in the crystals
D) The mechanical strength is maximum

6. The number of four-fold rotation axes in a cubic unit cell are
A) 7 B) 9 C) 3 D) 5

7. Which of the following information about crystal is not yielded by X-ray diffraction studies:
A) Dimensions of unit cell of the crystal
B) Shape of the unit cell of the crystal
C) Symmetries observed by the crystal
D) Atoms or molecules or group of atoms occupying lattice positions

8. Silver has FCC structure. If inter-atomic separation between atoms 0.288nm then lattice constant is
A) 0.204nm B) 0.408nm C) 0.144nm D) 10nm

9. The spacing between the principal planes of a crystal is $0.2nm$. It is found that the first order Bragg reflection of a beam of monochromatic x-rays occurs at an angle of 30^{o}, then the wavelength of x-rays is:
A) 0.05nm B) 0.1nm C) 0.2nm D) 0.4nm

10. Which of these is not a ferroelectric material
A) Rochelle salt B) Potassium Diphosphate
C) $SrTiO_3$ D) Quartz.

11. Which of the following magnetic phenomenais temperature independent
A) Ferromagnetism B) Paramagnetism C) Ferrimagnetism D) Diamagnetism

12. Which of the following statements is not true about effective mass of electron in a crystal:
A) It is positive within the allowed energy regions
B) It is zero at the topmost level of band
C) It is negative in the forbidden zone
D) Always remains positive

13. Which of the following phenomena indicate the onset of superconductivity
A) Very high electric resistance and high thermal conductivity
B) Nearly zero electric resistance and perfect diamagnetic nature
C) Very low specific heat and high band gap energy
D) Very high specific heat and low electric resistance

14. At very high frequency of alteration of electric field applied on a dielectric medium, the insulating nature is observed only if
A) Electronic polarizability is non-vanishing
B) Ionic polarizability vanishes
C) All the three polarizabilities vanish
D) Dipolar polarizability vanishes

15. Two consecutive planes having Miller indices (034) and lattice constants a=b=c=10nm are separated by a distance of
A) 2.8nm B) 3.2nm C) 3nm D) 2nm

16. Which of the following is not an ionic defect
A) Frankel defect B) Schottky defect
C) Color Centre D) Interstitial impurity

17. The tensile strength of metals is much less than theoretically predicted value because
A) Most of the metals have dislocations induced in them
B) Most metals are extractable in pure form
C) Point defects reduce the actual strength
D) Point defects enhance mechanical strength

18. If the Fermi energy of silver at zero Kelvin is 5eV, the mean energy of electron in silver at 0K is
A) 5 eV B) 7.5 eV C) 12 eV D) 3 eV

19. The wave function of a particle is represented as $\Psi = A\, e^{i \propto x}$ for being present in the region 0 < x < L. The value of normalization constant A is
A) $\sqrt{\frac{2}{L}}$ B) $\sqrt{\frac{1}{L}}$ C) $\frac{2}{L}$ D) $\frac{1}{L}$

20. What is the lattice constant for a FCC lattice having atomic radius 1.476 Å
A) 1.476 Å B) 5.216 Å C) 4.175 Å D) 3.408 Å

21. A superconducting material when placed in a magnetic field will
A) Attract the magnetic field towards its centre
B) Repel all the magnetic lines of forces passing through it
C) Attract the magnetic field but transfer it into a concentrated zone
D) Not influence the magnetic field at all

22. Time independent Schrodinger's equation of a system represents the conservation of
A) Total energy of the system B) Total potential energy of the system
C) Total Kinetic energy of the system D) Total binding energy of the system

23. The de-Broglie wavelength of an electron accelerated from rest on application of potential of 400 V is:
A) 0.165 Ǻ B) 0.512 Ǻ C) 0.613 Ǻ D) 0.251 Ǻ

24. The FTIR spectrometer is based on the principle of
A) Fabry Parot interferometer B) Michelson interferometer
C) X-ray Diffractometer D) Electron microscope

25. Identify the initiator used in anionic addition polymerization
A) BuLi B) BF_3
C) Ziegler Natta catalyst D) Benzoyl peroxide

26. Which is the correct order of energy required for various electronic transitions
A) n to Π* › σ to σ* › Π to Π* › n to σ* B) σ to σ* › n to σ* › Π to Π* › n to Π*
C) σ to σ* › Π to Π* › n to Π* › n to σ* D) n to σ* › Π to Π* › n to Π* › σ to σ*

27. The specific corrosive environment for stress corrosion of stainless steel is
A) Nitrate solution B) Ammonia solution
C) Alkali solution D) Water containing electrolytes

28. The attack of O_2 on Mo leads to formation of layer, which is
A) Non stable B) Stable C) Porous D) Volatile

29. Identify the non-conducting polymer of the following:
A) Poly-acetylene B) Poly-pyrrole C) Poly-thiophene D) Polyethylene

30. The number of peaks observed in IR spectra of H_2O is
A) 3 B) 4 C) 2 D) 5

31. Entropy change in an isobaric process is expressed as:
A) $nC_p \ln T_2/T_1$ B) $-nR\ln P_2/P_1$ C) $nR\ln V_1/V_2$ D) $-nR\ln P_1/P_2$

32. The entropy change accompanying the heating of one mole of helium ($C_v = 3/2R$) from a temperature of 100K to 300K at constant pressure is
A) 25.17 J/K mol B) -13.17 J/K mol C) 22.83 J/K mol D) 13.17 J/K mol

33. The origin of superconductivity is owing to
A) Formation of Cooper pairs B) All electrons losing their energy
C) Polarisation of medium D) Loss of magnetic nature of material

34. When electromagnetic wave propagates through a dielectric medium, then
A) Electric and magnetic fields oscillate in phase and with same frequency
B) Electric and magnetic fields oscillate in phase but not with same frequency
C) Magnetic field oscillates with a phase lag relative to electric field
D) Electric field oscillates with a phase lag relative to magnetic field

35. The relative permittivity of the medium is 3.24. The refractive index of this medium will be:
A) 2.2 B) 1.8 C) 1.6 D) 2.0

36. The kinetic energy of each of the electron and positron generated in the pair production of photon having energy of 1.522MeV will be
A) 756KeV B) 250KeV C) 400KeV D) 150KeV

37. A photon of 45 pico-meter wavelength undergoes scattering by loosely bound electron nearly at rest. The maximum wavelength of the scattered photon will be

A) 40 pico-meter B) 74 pico-meter C) 48 pico-meter D) 24 pico-meter

38. The photoelectric emission of K-shell electron, with binding energy of 3.2eV, is caused by a 6.5keV photon. The kinetic energy of emitted electron is:

A) 9.7keV B) 4.9keV C) 3.3keV D) 3.2keV.

39. The atomic packing fraction of diamond crystal is

A) 0.34 B) 0.52 C) 0.68 D) 0.72

40. Number of atoms per unit cell in case of hexagonal cubic cell is

A) 6 B) 1 C) 3 D) 4

41. Which of the following is a property of ionic solids:

A) Soft B) Conductors

C) Low melting point D) Soluble in polar solvents.

42. Which of the following can't be used as a mechanism to strengthen metals:

A) Grain size reduction B) Strain hardening

C) Solid solution alloying D) Creating polycrystalline structures.

43. Which of the following techniques is used for multilayer deposition, when very high precision and purity is desired:

A) Thermal evaporation B) Molecular beam epitaxy

C) Sputtering D) Electron beam evaporation.

44. Which of the following is not a low dimensional system:

A) Quantum Dot B) Quantum flower C) Quantum Well D) Quantum Wire

45. Which of the following is a bottom up method of fabricating nanostructured materials:

A) Photolithography B) Milling C) Sol-Gel Method D) Etching

46. In a C60 molecular structure, which of the fact is not true

A) C-C catenation plays role
B) No two pentagonal networks of carbon atoms lie adjacent to each other
C) The hexagonal and pentagonal networks of carbon atoms alternate each other
D) It is another allotropic form of carbon

47. What is untrue about dislocations in the crystals

A) They are created due to metallurgical operations
B) They enhance mechanical strength of pure metals
C) Alloys lose their mechanical strength due to deposition of doped impurities in the regions of dislocations
D) Dislocation increase stress in the crystal

48. The crystal planes which are more prone to slip are characterised by

A) High planer atomic density only
B) Low Miller indices only
C) High planar density as well as low Miller indices
D) Low planar density and high values of Miller indices

49. The diffusion coefficient does not depend upon

A) Temperature of crystal
B) Combination of solute and solvent
C) Crystal structure of solvent medium
D) Size of the solvent atom

50. For the Van der Waal's force, the dependence of the interaction energy on distance r is proportional to

A) ~ r^{-6} B) ~ r^{-7} C) ~ r^{-3} D) ~ r^{2}

x-x-x

Biotechnology Engineering(Ph.D.)

1. During each cycle of PCR the reaction mixture is transferred between three temperatures. All the following statements are true for these temperatures, except;

A) The denaturation temperature helps to release the single stranded DNA to act as templates
B) The hybridization temperature facilitates primers to attach to the templates.
C) Annealing temperature is the one at which DNA synthesis occurs.
D) The extension temperature is usually set just below the optimum temperature of *Taq* polymerase.

2. Which of the following is a RefSeq accession number corresponding to an mRNA;

A) X01537 B) AAA12345 C) NT_008769 D) NM_006744

3. 1000 liter bioreactor contains 10 g / L of growing cells with qO_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 oxygen utility rate (OUR) (mmoles of O_2/g cells per hr) of the process.

A) 200 B) 250 C) 1500 D) 150

4. The clone contigs generated in a genome sequencing project can be assembled by which of the following techniques;

A) Chromosome mapping B) Chromosome walking
C) Karyotyping D) Clone fingerprinting

5. The most frequently used examples of promoters in expression vectors for *E.Coli* are listed below, except one of these. Identify the incorrect answer;

A) *lac*-promoter B) *trp*-promoter C) *tac*-promoter D) *cmv*-promoter

6. All the following statements are true for Gene subtraction technique except one. Identify the incorrect statement;

A) Actual removal of gene B) Inactivation by antisense technology
C) Silencing of a single gene D) Disabling a subset of genes

7. A crystalline or paracrystalline deposit within a cell, often containing substantial quantities of insoluble proteins are called;

A) Microsomal bodies B) Micro bodies
C) Inclusion bodies D) Lysosomal bodies

8. The codons are not used equally frequently in the genes of all organisms. This condition is termed as;

A) Codon selection B) Codon option C) Codon bias D) Codon candidate

9. The marker gene Dihydrofolate reductase used for mammalian cells can be managed by which one of the following selective agents;

A) Methotrexate B) Methionine sulfoximine
C) G-418 D) Hygromycin B

10. Which of the following correctly applies to k_La?

A) Henry's law coefficient B) Volumetric oxygen transfer coefficient
C) Volumetric mass transfer coefficient D) Volumetric solute transfer coefficient

11. All the following statements are true for Sodium dodecyl sulphate polyacrylamide gel electrophoresis, except;

A) It uses anionic surfactant detergent SDS
B) The proteins are denatured in presence of SDS
C) The proteins acquire negative charge
D) The proteins lose their primary structure in addition to secondary structure

12. In order to compare two distantly related protein sequences, which PAM or BLOSUM matrix is best used to compare them;

A) BLOSUM 45 or PAM250 B) BLOSUM 45 or PAM10
C) BLOSUM 80 or PAM250 D) BLOSUM 45 or PAM10

13. Oxygen can become limited in high –density cultures. This problem can be overcome by all the following methods, except;

A) Rate of sparging can be increased
B) Pure oxygen can be introduced
C) Expression of hemoglobin gene
D) Growing cells under low pressure to increase solubility of oxygen

14. Epithelial and lymphocytes cells generally produce which of the following Antimicrobial peptide.

A) Abzymes B) Defensins
C) Monoclonal antibodies D) Polyclonal antibodies

15. All the following enzymes are used as DNA modifying enzymes for addition or removal of specific chemical groups, except;

A) Alkaline phosphatase B) Polynucleotide kinase
C) Terminal deoxynucleotidyl transferase D) Pyruvate kinase

16. The local alignment for two protein or DNA sequences can be performed by which of the following algorithms;

A) Smith and Waterman B) Needleman-Wunsch
C) Jukes-Cantor D) Markov -Waterman

17. A protein sequence has been provided with least detectable homologs. In order to predict protein structure which method would be best option;

A) Homology Modeling B) Ab initio modeling
C) Comparative modeling D) Threading

18. For an ideal CSTF operation, which of the following is assumed as negligible;

A) Disappearance of reactant B) Inflow
C) Outflow D) Accumulation

19. All the following mentioned are gradient materials used in centrifugation, except one. Identify the non-gradient material;

A) Ficoll B) Sucrose C) Cesium chloride D) Calcium chloride

20. The resolving power of a microscope is dependent on numerical aperture of a system of lens by which of the following mentioned relations;

A) Directly proportional B) Inversely proportional

C) It is half the value of numerical aperture D) No relational ship of two terms

21. A laboratory technique that locates mRNA sequences on a gel that are complementary to a piece of DNA probe is termed as;

A) Microarray B) *In-situ* hybridization
C) Northern Blot D) Gel mobility shift assay

22. Which of the following is the true characteristic of an ideal plug flow reactor;

A) Mixing B) Variation
C) Variation but no mixing D) Neither mixing nor variation

23. The extinction coefficient of a compound is $1.5M^{-1}cm^{-1}$ .What will be the concentration of this compound if its solution shows an absorbance of 1.20. Path length of sample is 2 cm;

A) 0.20M B) 0.40M C) 0.60M D) 0.80M

24. A patent and a copyright is granted by government for a period of how many years;

A) 20 and 10 respectively B) 10 and 20 respectively
C) Both for 20 years D) Both for 10 years

25. The procedure for selecting hybridoma cells requires HAT medium containing aminopterin. This is included in the medium because;

A) It provides a precursor for purine metabolism.
B) It inhibits purinre metabolism activity.
C) It provides a precursor for dihydrofolate reductase activity.
D) It inhibits dihydrofolate reductase activity.

26. *Agrobacterium tumefaciens* respond to which of the following plant molecules by inducing *vir* genes of Ti plasmid;

A) Syringone molecules B) Auxin molecules
C) Opine molecules D) Cytokinin molecules

27. A monoclonal antibody that has catalytic activity is called as;

A) Monozyme B) Abzyme C) Clonzyme D) Abclone

28. Glycogen breakdown requires the action of all of the following enzymes, except one;

A) Glycogen phosphorylase B) Glycogen debranching enzyme
C) Phosphoglucomutase D) Phosphoglucose isomerase

29. The streptomycin derived coumarin family of antibiotics function by inhibiting which of the following enzymes;

A) DNA gyrase B) DNA polymerase
C) RNA polymerase D) Aminoacyl tRNA synthase

30. Recombination of immunoglobin gene segments will promote all of the following function, except;

A) Increase in Ig diversification
B) Assembly of Ig coding sequence
C) Permit changes in coding information during B-cell maturation
D) Generation of various classes of antibody in response to one antigen

31. All the following statements are true for MHC molecules and genes , except one;

A) Class I and Class II are membrane bound glycoproteins
B) Both Class I and II are able to make stable complexes with peptide ligands
C) Class III molecules are complement proteins
D) Class I, II and III have identical functions.

32. During PCR Amplification at which cycle you would observe for the first time right size fragment getting amplified;

A) 1^{st} B) 3^{rd} cycle C) 13^{th} cycle D) 30^{th} cycle

33. In All the following operation, except one, diffusion of solids do not occur.

A) Drying B) Distillation C) Absorption D) Adsorption

34. In order to physically remove the carbon dioxide from the system, which of the following process can be exploited;

A) Adsorption B) Cation Exchanger C) Filteration D) Absorption

35. The unit of diffusivity are represented as ;

A) m^2/s^2 B) m/s^2 C) m/s D) m^2/s

36. 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

37. Which of the following value correctly represents pH of $1x10^{-3}$ M potassium hydroxide.

A) 3 B) 11 C) 8 D) -3

38. You are asked to clone a plant gene using *Agrobacterium tumifaciens.* You are asked to use binary vector for this cloning process. Which of the following vectors you would chose for this experiment.

A) Vector that has vir genes in separate vector and Ti DNA replaced with target genes in other vector
B) Vector that has all the components of Ti plasmid
C) Vector that has vir genes and T-DNA together on one vector and target gene in other vector
D) Vector that has vir genes and target genes in separate vector and Ti DNA in other vector

39. A number of plasmid combinations were present in the 'super-bug' created by Chakrabarty and coworkers. Identify the correct answer;

A) CAM,OCT,NAH,XYL B) CAM,WWO,NAH,XYL
C) CAM,OCT,GPD,XYL D) CAM,GPD,NAH,XYL

40. 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

41. All the following statements are untrue for Maxam-Gilbert method of DNA sequencing, except one Identify the correct statement;

A) It requires double stranded DNA fragments
B) Cloning into M13 vector is mandatory step

C) Primer is required
D) No labelled DNA is obtained

42. On doubling the reactant concentration the rate of reaction is increased three folds. What is the order of the reaction;

A) 2 B) 3 C) 1.45 D) 1.58

43. Which of the following statements best defines the term C value paradox;

A) The nucleotide C is over represented in some genomes.
B) The genome size of various eukaryotes correlates poorly with the number of proteins of the organism
C) The genome size of various eukaryotes correlates poorly with the biological complexity of the organism
D) The genome size of various eukaryotes correlates poorly with the evolutionary data of the organism

44. How does the apparent viscosity of Non-Newtonian fluids behave;

A) Constant B) Dynamic
C) Depends on the shear stress D) Depends on the shear rate

45. A completely mixed continuous bioreactor used for the cultivation of cells having control of flow rate and concentration of growth-limiting nutrient in the liquid medium entering and exiting a growth chamber is known as;

A) Turbidostat B) Hemostat C) Thermostat D) Chemostat

46. 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) 0.0

47. During RNA silencing mechanism, which of the following component destroys the target mRNA

A) Overhangs of double stranded DNA B) Argonaute
C) Dicer D) Restriction endonuclease

48. How many approximate numbers of clone would be needed for a genomic library of an organism that has genome size of 4.6×10^6 bp, with average size of 17 kb fragment inserted in to the vector and with the probability of every gene that is being represented is 95%.

A) 8200 B) 820 C) 1500 D) 21000

49. You have isolated a novel microbial peptide. Upon exposing the cells to this peptide you observed that the M phase of these cells was reduced from 1 hr to 30 seconds. With the result that there was significant reduction in the overall time lag required for cells to undergo division. Which of the following best explains the character of this novel peptide?

A) The peptide is inducing mitogenic signal
B) The peptide induced morphogenic signal
C) The peptide inhibited mitogenic signal
D) The peptide inhibited morphogenic signal

50. Deviations from the ideal plug flow pattern are referred as ;

A) Linear dispersion B) Axial dispersion
C) Circular dispersion D) Non-dispersion

Chemical Engineering(Ph.D)

1. A ..... gauge is an instrument to measure very low pressures, as low as 10^{-7} Torr.

A) Capsules
B) McLeod
C) Bellows
D) Diaphragm

2. Which of the following methods of depreciation calculations results in book values greater than those obtained with straight line method?

A) Declining balance method
B) Multiple Straight Line Balance
C) Sinking fund method
D) Sum of the years digit method

3. Stanton number for mass transfer is defined as

A) (Re x Sherwood number)/Schmidt Number
B) Sherwood number/ (Re x Schmidt Number)
C) Re/(Schmidt Number x Sherwood number)
D) Schmidt Number/(Sherwood number x Re)

4. Overall efficiency of the distillation column is

A) Always more than the point efficiency
B) The ratio of number of ideal plates to actual plates
C) Same as Murphree efficiency
D) The ratio of number of actual plates to ideal plates

5. Dittus-Boelter equation cannot be used for molten metals mainly due to its very low

A) Viscosity
B) Grashoff number
C) Thermal conductivity
D) Prandtl number

6. Acetic acid will be most economically separated from a dilute solution of acetic acid in water by

A) Continuous distillation
B) Solvent extraction
C) Evaporation
D) Absorption

7. The weight fraction of methanol in an aqueous solution is 0.64. The mole fraction of methanol x_M satisfies

A) $x_M < 0\ 5$
B) $x_M \geq 0.64$
C) $0.5 < x_M < 0.64$
D) $x_M = 0.5$

8. The molar composition of a gas is 10% H_2, 10% O_2, 30% CO_2 and balance H_2O. If 50% H_2O condenses, the final mole percent of H_2 in the gas on a dry basis will be

A) 5%
B) 18.18%
C) 10%
D) 20%

9. Triple superphosphate is manufactured by reaction

A) Phosphate rock with nitric acid
B) Ammonium phosphate with phosphoric acid
C) Phosphate rock with sulphuric acid
D) Phosphate rock with phosphoric acid

10. A heat engine operates at 75% of the maximum possible efficiency. The ratio of the heat source temperature (in kelvin) to the heat sink temperature (in kelvin) is 5/3. The fraction of the heat supplied that is converted to work is

A) 0.6 B) 0.4

C) 0.2 D) 0.3

11. In the laminar boundary layer flow over a flat plate, the ratio (δ /x) varies as (where, δ is the boundary layer thickness and x is the distance from the leading edge in the direction of flow)

A) Re B) $\sqrt{Re}$

C) $1/\sqrt{Re}$ D) 1/ Re

12. An electrically heated element is submerged in a pool of water at its saturation temperature. As the temperature of the element increases, the maximum heat transfer coefficient is observed

A) In the incipient nucleate boiling regime B) In the stable film boiling regime without significant radiation effects

C) In the free convection regime D) Between the nucleate boiling and partial nucleate boiling mixed with unstable film boiling regimes

13. A first order system with unity gain and time constant τ is subjected to a sinusoidal input of frequency $\omega = 1/\tau$. The amplitude ratio for this system is

A) 0.5 B) $1/\sqrt{2}$

C) 0.25 D) 1

14. As pressure approaches zero, the ratio of fugacity to pressure (f/p) for a gas approaches

A) Unity B) Infinity

C) Zero D) An indeterminate value

15. Which of the following is the most suitable for very high pressure gas phase reaction?

A) Fluidised bed reactor B) Stirred tank reactor

C) Batch reactor D) Tubular flow reactor

16. When dilute aqueous solution of two salts are mixed, the process is associated with

A) Change in temperature which is a function of composition B) No change in temperature

C) Decrease in temperature D) Increase in temperature

17. Which of the following gases is NOT responsible for global warming?

A) Water vapour B) Methane

C) Nitrogen D) Carbon dioxide

18. Zeolite ZSM-5 is added to commercial FCC catalyst for

A) Enhancing octane number B) Promoting CO oxidation

C) Improving tolerance to metal content in feed D) Promoting SO_2 reduction

19. In a co-current double pipe heat exchanger used for condensing saturated steam over the inner tube, if the entrance and exit conditions of the coolant are interchanged, then the rate of condensation will

A) Either increase or decrease; depends on the coolant flow rate
B) Decrease
C) Increase
D) Remain unchanged

20. The reaction A + 2B → products has been found to have the rate law, rate = $k[A][B]^2$. While holding the concentration of A constant, the concentration of B is increased from x to 3x. Predict by what factor the rate of reaction increases.

A) 6
B) 3
C) 27
D) 9

21. Baffles are used in heat exchangers in order to

A) Prevent shell expansion due to thermal effects
B) Promote cross flow and turbulence in the shell side fluid
C) Increase the tube side fluid's heat transfer coefficient
D) Promote vibration in the heat exchanger

22. For a particle settling in water at its terminal settling velocity, which of the following is true?

A) Drag = Buoyancy + Weight
B) Drag = Weight
C) Weight = Buoyancy + Drag
D) Buoyancy = Weight + Drag

23. The Beer-Lambert Law gives a linear correlation with positive gradient between:

A) Absorbance and concentration
B) Molar extinction coefficient and concentration
C) Molar extinction coefficient and absorbance
D) Wavelength and absorbance

24. For estimation of heat capacity of a solid compound, one can use

A) Kopp's rule
B) Gibb's equation
C) Trouton's rule
D) Clapeyron equation

25. For gas absorption the height of a transfer unit, based on the gas phase, is given by (G = superficial molar gas velocity; L = superficial molar liquid velocity; F_G = mass transfer coefficient in mol/m^2-s; a = interfacial area per unit volume of tower)

A) $F_G/G\ a$
B) $G/F_G\ a$
C) $G\ a/F_G$
D) $L/F_G\ G$

26. The Reynolds analogy for momentum, heat and mass transfer is best applicable for

A) Gases in laminar flow
B) Liquids and gases in laminar flow
C) Liquids in turbulent flow
D) Gases in turbulent flow

27. Component A is diffusing in a medium B. The flux N_A relative to a stationary point is equal to the flux due to molecular diffusion if

A) There is equimolar counter-diffusion
B) Mass transfer is accompanied by reaction
C) Molecular mean free path is high
D) Diffusion of A is in stagnant medium B

28. For high pressure process equipments/vessels, the connected nozzle should be

A) Brazed
B) Screwed
C) Welded
D) Flanged

29. In forced convection, the Nusselt number Nu is a function of

A) Pr and Gr
B) Re and Sc
C) Re and Pr
D) Re and Gr

30. The process used for relieving the internal stresses previously set up in the Metal and for increasing the machinability of steel, is

A) Process annealing
B) Spheroidising
C) Normalising
D) Full annealing

31. Producer gas is obtained by

A) Partial combustion of coal, coke, anthracite coal or charcoal in a mixed air steam blast
B) Passing steam over incandescent coke
C) Passing air and a large amount of steam over waste coal at about 650°C
D) Carbonisation of bituminous coal

32. Free flowing granular materials can be best dried in a _____ drier

A) Rotary
B) Drum
C) Cylinder
D) Freeze

33. In a refinery, petroleum crude is fractionated into gas fraction, light ends, intermediate distillates, heavy distillates, residues and by products. The group of products including gas oil, diesel oil and heavy fuel oil belongs to the fraction

A) Intermediate distillates
B) Heavy distillates
C) Residues
D) Light ends

34. 1 m^3 of an ideal gas at 500 K and 1000 kPa expands reversibly to 5 times its initial volume in an insulated container. If the specific heat capacity (at constant pressure) of the gas is 21 J/mol-K, the final temperature will be

A) 274 K
B) 35 K
C) 154 K
D) 174 K

35. A flow is called sub-sonic, if the Mach number is

A) Between 1 and 6
B) Less than unity
C) More than 6
D) Unity

36. The ability of a material to absorb energy in the plastic range is called

A) Creep
B) Resilience
C) Toughness
D) Fatigue strength

37. Coefficient of Performance (COP) of a refrigerator is the ratio of

A) Work required to refrigeration obtained
B) Lower to higher temperature
C) Refrigeration obtained to work required
D) Higher to lower temperature

38. The limit beyond which the material does not behave elastically is known as

A) Yield Point
B) Proportional limit
C) Plastic limit
D) Elastic limit

39. Cloud point refers to the _____below which wax in diesel or biowax in biodiesels forms a cloudy appearance

A) Temperature
B) Pressure
C) Density
D) Viscosity

40. If response of a control system is to be free of offset and oscillation, the most suitable controller is

A) Proportional integral-derivative (PID) controller
B) Proportional-derivative (PD) controller
C) Proportional-integral (PI) controller
D) Proportional controller

41. Dimension of absolute viscosity is

A) MLT^{-1}
B) $ML^{-1}T$
C) MLT
D) $ML^{-1}T^{-1}$

42. Weeping in a distillation column

A) Increases tray efficiency
B) Results due to very low gas velocity
C) Provides large interfacial surface for mass transfer
D) Results due to very high gas velocity

43. Maintenance cost of a _____ pump for a particular duty is the least

A) Gear
B) Centrifugal
C) Volute
D) Reciprocating

44. _____ columns are used for liquid dispersion in a continuous gas phase

A) Sieve tray
B) Pulse
C) Bubble cap
D) Packed

45. An operator was told to control the temperature of a reactor at 60^oC. The operator sets the set-point of the temperature controller at 60^oC. The scale actually indicated 0 to 100% of a temperature range of 0 to 200^oC. This caused a runaway reaction by over pressurizing the vessel, which resulted in injury to the operator. The actual set-point temperature was

A) 120^oC
B) 200^oC
C) 100^oC
D) 60^oC

46. In petroleum refining operations, the process used for converting paraffins and naphthalenes to aromatics is

A) Alkylation
B) Catalytic reforming
C) Catalytic cracking
D) Hydrocracking

47. Which of the following has the lowest cetane number?

A) Aromatics
B) Naphthenes
C) i-paraffins
D) Olefins

48. Utilities cost in the operation of chemical process plant comes under the

A) Plant overhead cost
B) Direct production cost
C) Fixed charges
D) General expenses

49. Which one of the following sensors is used for the measurement of temperature in a combustion process ($T > 1800^{o}C$)

A) Resistance temperature detector
B) Type J thermocouple
C) Pyrometer
D) Thermistor

50. The heat transfer by radiation from a mild steel surface is to be reduced by reducing the emissivity of the surface. This can be best achieved by

A) Giving the surface a mirror finish
B) Painting the surface black
C) Roughening the surface
D) Painting the surface white

x-x-x

Civil Engineering(Ph.D.)

1. If allowable percentage error in the estimate of basic rainfall is E and coefficient of variation of rainfall is Cv, then the optimum number of raingauges is given by:
   A) $\frac{C_v}{E}$
   B) $\sqrt{\frac{C_v}{E}}$
   C) $\left(\frac{C_v}{E}\right)^2$
   D) $\left(\frac{C_v}{E}\right)^{3/2}$
2. The normal annual precipitation at stations X, A, B and C are 700mm, 1000mm, 900mm and 800 respectively. If the storm precipitation at three station A, B and C were 100 mm, 90mm, and 80mm respectively, then the storm precipitation for station X will be
   A) 70mm
   B) 80mm
   C) 90mm
   D) 105mm
3. A concrete beam of rectangular cross-section of 200mm×400mm is prestressed with a force of 400kN at an eccentricity of 100mm.The maximum compressive stress in the concrete is
   A) 12.5N/mm^2
   B) 7.5N/mm^2
   C) 5.0N/mm^2
   D) 2.5N/mm^2
4. The ratio of average values of shear stresses produced on the bed and the banks of a channel due to flowing water is
   A) Less than 1
   B) Equal to 1
   C) Greater than 1
   D) Equal to zero
5. If the critical shear stress of a channel is τ_c then the average value of shear stress required to move the grain on the bank is
   A) 0.5 τ_c
   B) 0.75 τ_c
   C) τ_c
   D) 1.33 τ_c
6. A water shed canal
   A) Irrigates only on one side
   B) Is most suitable in hilly areas
   C) Avoids the cross drainage works
   D) Is generally aligned parallel to the contours of the area
7. An aggrading river is a
   A) Silting river
   B) Scouring river
   C) Both silting and scouring river

D) Neither silting nor scouring river

8. Main purpose of mean water training for rivers is
   A) Flood control
   B) To provide sufficient depth of water in navigable channels, during low water periods
   C) To preserve the channel in good shape by efficient disposal of suspended and bed load
   D) Flow analysis

9. The maximum average depth due to one day storm over an area of 100 km^2 is 100mm. Depth-Area-Duration (DAD) curves indicate that for the same area of 100 km^2 the maximum average depth for a 3 hour storm will be
   A) 100mm
   B) More than 100mm
   C) Less than 100mm
   D) Infinite

10. A 6 hours storm had 4cm of rainfall and the resulting runoff was 2 cm. If φ index remains at the same value, the runoff due to 10 cm of rainfall in 12 hours in the catchment is
   A) 4.5cm
   B) 6.0cm
   C) 7.5cm
   D) 9.0cm

11. The peak of a 4 hours flood hydrograph is 240 m^3/sec. If the rainfall excess is 80mm and base flow which is constant is 40m^3/sec, then the peak of 4 hours unit hydrograph will be
   A) 20 m^3/sec
   B) 25 m^3/sec
   C) 30 m^3/sec
   D) 35 m^3/sec

12. The relationship between the radius of curvature *R*, bending moment *M* and flexural rigidity *EI* is given by
   A) $R = \frac{M}{EI}$
   B) $M = \frac{EI}{R}$
   C) $EI = \frac{R}{M}$
   D) $E = \frac{MI}{R}$

13. A short column of external diameter of 250mm and internal diameter of 150mm carries an eccentric load of 1000kN. The greatest eccentricity which the load can have without producing tension anywhere is
   A) 20mm
   B) 31.25mm
   C) 37.5mm
   D) 42.5mm

14. the percentage compensation in gradient for ruling gradient of 4% and horizontal curve of radius 760m is
    A) 0.1%
    B) 1.0%
    C) 10%
    D) No compensation
15. Maximum number of vehicles can be parked with
    A) Parallel parking
    B) 30^o angle parking
    C) 45^o angle parking
    D) 90^o angle parking
16. As per IRC recommendations, the average level of illumination on important roads carrying fast traffic is
    A) 10 lux
    B) 15 lux
    C) 20 lux
    D) 30 lux
17. A cast iron block of 5 cm^2 cross section carries an axial tensile load of 10 t. Then maximum shear stress in the block is given by
    A) 2000kg/cm²
    B) 1000kg/cm²
    C) 500kg/cm²
    D) 200kg/cm²
18. Rigidity factor for a tyre pressure greater than 7 kg/cm2 is
    A) Equal to one
    B) Less than one
    C) Greater than one
    D) Zero
19. For sandy soil the most common method of stabilization is
    A) Soil cement stabilization
    B) Mechanical stabilization
    C) Soil lime stabilization
    D) Soil bitumen stabilization
20. Ratio of the width of the car parking area required at kerb for 30^o angle parking relative to 60^o angle parking is approximately
    A) 0.5
    B) 0.7
    C) 0.8
    D) 2.0
21. The amount of mechanical energy imposed on the aggregates during the aggregate impact test is of the order of
    A) 5320 kg-cm
    B) 6750 kg-cm
    C) 7980 kg-cm
    D) 11400 kg-cm

22. Rapid curing cutback bitumen is produced by blending bitumen with
    A) Kerosene
    B) Benzene
    C) Diesel
    D) Petrol
23. Number of keys used in CST-9 sleeper is
    A) 2
    B) 3
    C) 4
    D) 5
24. Cant deficiency occurs when a vehicle travels around a curve at
    A) Equilibrium speed
    B) Speeds higher than equilibrium speed
    C) Speeds lower than equilibrium speed
    D) Booked speed
25. A train is hauled by 2-8-2 locomotive with 22.5 tonnes on each driving axle. Assuming the coefficient of friction to be 0.25, what would be the hauling capacity of the locomotive?
    A) 15.5 tonnes
    B) 22.5 tonnes
    C) 45.0 tonnes
    D) 90.0 tonnes
26. What will be the curve lead for a 1 in 8.5 turnout taking off from a straight broad gauge track?
    A) 28.49 m
    B) 21.04 m
    C) 14.24 m
    D) 7.45 m
27. For a sleeper density of (n+5), the number of sleepers required for constructing a broad gauge railway track of length 650 m is
    A) 975
    B) 918
    C) 900
    D) 880
28. If the total hardness of water is greater than its total alkalinity, the carbonate hardness will be equal to
    A) Total alkalinity
    B) Total hardness
    C) Total hardness minus total alkalinity
    D) Non carbonate hardness
29. The chemical most commonly used to increase speed of sedimentation of sewage is
    A) Sulphuric acid
    B) Copper sulphate
    C) Lime
    D) Sodium permanganate

30. Double filtration is used
    A) To increase the filtration capacity of slow sand filters
    B) To increase the filtration of rapid sand filters
    C) For isolated buildings like swimming pools, hotels etc.
    D) Both (A) & (B)
31. Sewage systems are usually designed for
    A) 10 years
    B) 25 years
    C) 50 years
    D) 75 years
32. If the time of concentration is 9 minutes, then the intensity of rainfall according to British Ministry of Health formula will be
    A) 4 mm/hr
    B) 10 mm/hr
    C) 20 mm/hr
    D) 40 mm/hr
33. The ratio of 5 day BOD to ultimate BOD is about
    A) 1/3
    B) 2/3
    C) 3/4
    D) 1.0
34. Corrosion in concrete sewers is caused by
    A) Septic conditions
    B) Dissolved oxygen
    C) Chlorine
    D) Nitrogen
35. The specified standard for SO_2 under US Ambient Air Quality standards is 80 $\mu g/m^3$. This is approximately equivalent to
    A) 0.03 ppm
    B) 0.05 ppm
    C) 0.08 ppm
    D) 8.00 ppm
36. Blue baby disease (Methemoglobinemia) in children is caused by the presence of excess
    A) Chlorides
    B) Nitrates
    C) Fluorides
    D) Lead

37. A city supply of 15000 cubic metres of water per day is treated with a chlorine dosage of 0.5 ppm. For this purpose, the requirement of 25% bleaching power per day would be
    A) 300 kg
    B) 75 kg
    C) 30 kg
    D) 7.5 kg

38. If the methyl orange alkalinity of water equals or exceeds total hardness, all of the hardness is
    A) Non-carbonate hardness
    B) Carbonate hardness
    C) Pseudo hardness
    D) Negative non-carbonate hardness
39. For proper field control, which of the following methods is best suited for quick determination of water content of a soil mass?
    A) Oven drying method
    B) Sand bath method
    C) Alcohol method
    D) Calcium carbide method
40. Toughness index is defined as the ratio of
    A) Plasticity index to consistency index
    B) Plasticity index to flow index
    C) Liquidity index to flow index
    D) Consistency index to liquidity index

41. Effective stress on soil
    A) Increases void ratio and decreases permeability
    B) Increases both voids ratio and permeability
    C) Decreases both voids ratio and permeability
    D) Decreases void ratio and increases permeability
42. Base failure of a finite slope
    A) Occurs when soil below the level of toe is strong
    B) Occurs when there is a relatively weak zone in upper part of the slope
    C) Occurs when the soil below the toe is relatively soft and weak
    D) Is a most common failure and occurs in relatively steep slopes
43. The maximum differential settlement in isolated footings on clayey soils should be limited to
    A) 25 mm
    B) 40 mm
    C) 65 mm
    D) 100 mm
44. The largest value of stability number is
    A) 0.261
    B) 0.522
    C) 1.0
    D) 2.61
45. For sand of uniform spherical particles, the ratio of void ratios in the loosest and the densest states is
    A) 2.6
    B) 3.5
    C) 4.6
    D) 3.0

46. Given that damping ratio=0.1 and damping coefficient =225 kN sec/m. Then the critical damping coefficient in kN sec/m will be
    A) 22.5
    B) 225
    C) 2250
    D) 22500

47. The relationship between water content (w%) and number of blows (N) in soil, as obtained from Casagrande's liquid limit device is given by
    $W=20-\log_{10}N$

The liquid limit of the soil is:

    A) 15.6%
    B) 16.6%
    C) 17.6%
    D) 18.6%

48. Shear failure of soils takes place when
    A) The angle of obliquity is maximum
    B) Maximum cohesion is reached in cohesive soils
    C) φ reaches its maximum value in cohesionless soils
    D) Residual strength of the soil is exhausted

49. Under load, the void ratio of a submerged saturated clay decreases from 1.0 to 0.92. What will be the ultimate settlement of the 2 m thick clay due to consolidation?
    A) 20 mm
    B) 40 mm
    C) 80 mm
    D) 160 mm
50. Given that Plasticity index (PI) of local soil = 15 and PI of sand = zero, for a desired PI of 6, the percentage of sand in the mix should be
    A) 70
    B) 60
    C) 40
    D) 30

Computer Science & Engineering(Ph.D.)

1.	Which of the following is NOT a self-complementing code?	
	A)	8421 BCD
	B)	2421 BCD
	C)	84-2-1 BCD
	D)	Excess 3 Code
2.	If 23_x (in base-x number system) is equal to 34_y (in base-y number system), the possible values of x and y are	
	A)	3, 5
	B)	5, 3
	C)	2, 8
	D)	8, 16
3.	The simplified form of the Boolean expression $(A + B + AB)(A + C)$ is	
	A)	$A + B + C$
	B)	$AB + BC$
	C)	$A + BC$
	D)	$AC + B$
4.	A multiplexer is also known as	
	A)	Data selector
	B)	Data encoder
	C)	Data decoder
	D)	Data distributor
5.	A mod-2 counter followed by mod-3 counter is same as	
	A)	Mod-2 counter
	B)	Mod-3 counter
	C)	Mod-6 counter
	D)	Mod-5 counter
6.	If in a C program, arr refers to an array of 5 integers. Then, the type of expression &arr is	
	A)	int*
	B)	int(*)[5]
	C)	int*[5]
	D)	None of these
7.	In C programming language, which of the following statements can be used to terminate the current iteration of a loop?	
	A)	break statement
	B)	continue statement
	C)	return statement
	D)	None of these
8.	Which object is constant in the following C declaration statement int* constptr;?	
	A)	ptr
	B)	The object pointed to by ptr
	C)	Both ptr and the object pointed to by ptr
	D)	The given declaration is not valid

9.	What would be the asymptotic time complexity to add a node at the end of a singly linked list, if the pointer is initially pointing to the head of the list?	
	A)	$O(1)$
	B)	$O(lgn)$
	C)	$\Theta(n)$
	D)	$O(n^2)$
10.	The postfix representation of the expression (12-X)*(Y+9)/(Z*4) is	
	A)	4 Y * Z 9 + X 12 - * /
	B)	/ 12 X – Y 9 + Z 4 *
	C)	12 – X * Y + 9 / Z * 4
	D)	12 X – Y 9 + * Z 4 * /
11.	There are n nodes in a binary search tree. Consider the height of the tree as the number of edges in the longest path from the root to the leaf. The minimum possible height of the binary search tree can be	
	A)	$\lfloor \lg n \rfloor$
	B)	$\lceil \lg (n + 1) - 1 \rceil$
	C)	$\lfloor \lg (n + 1) + 1 \rfloor$
	D)	$\lceil \lg (n - 1) - 1 \rceil$
12.	Suppose that we have numbers between 1 and 1000 in a binary search tree and want to search for the number 363. Which of the following sequences could not be the sequence of node examined?	
	A)	2, 252, 401, 398, 330, 344, 397, 363
	B)	924, 220, 911, 244, 898, 258, 362, 363
	C)	925, 202, 911, 240, 912, 245, 258, 363
	D)	2, 399, 387, 219, 266, 382, 381, 278, 363
13.	Which of the following statements about is NOT correct?	
	A)	In-order traversal of min-heap outputs the keys in ascending order.
	B)	Removal of an item from max-heap outputs the maximum element in the heap.
	C)	Item is generally inserted at the end of the heap, and later brought to correct position using adjust procedure.
	D)	A heap can be stored in an array.
14.	Suppose the number of elements in a sorted array is 1000. The number of comparisons done by binary search algorithm in worst case to search an element is	
	A)	9
	B)	10
	C)	11
	D)	100
15.	The solution of the recurrence relation $T(n) = 4T\left(\frac{n}{2}\right) + \Theta(n^2)$ is	
	A)	$\Theta(nlogn)$
	B)	$\Theta(n^2)$
	C)	$\Theta(n^2logn)$
	D)	$\Theta((nlogn)^2)$
16.	The number of edges in a minimum cost spanning tree of a graph $G = (V, E)$ is	
	A)	$\lvert V \rvert - 1$
	B)	$\lvert V \rvert$

	C)	$\frac{\lvert E\rvert}{2}$
	D)	$\lvert E\rvert$
17.	Which of the following statement about Floyd-Warshall's algorithm is/are FALSE?	
	A)	It is used to solve all-pair shortest path algorithm
	B)	It is based on dynamic programming
	C)	It cannot work on a graph having edges with negative edge weight
	D)	The time complexity of the algorithm is $O(\lvert V\rvert^3)$, where $\lvert V\rvert$ are the number of edges in the graph
18.	Suppose that the universe U has the keys $\{0 \dots n^2 - 1\}$. For a hash table of size n, what is the greatest number of distinct keys the table can hold with chaining as the collision resolution strategy?	
	A)	n
	B)	$n^2 - 1$
	C)	n^2
	D)	$n^2 + 1$
19.	The following keys are inserted in a hash table (in the given order) with 7 slots (indexed from 0 to 6) using linear probing and hash function $h(k) = k \ mod \ 7$: 4, 11, 5, 12, 6 What is the index of the slot in which the key value 6 is stored?	
	A)	1
	B)	4
	C)	5
	D)	6
20.	The time complexity of bubble sort in best case is	
	A)	$\Theta(n)$
	B)	$\Theta(nlogn)$
	C)	$\Theta(n^2)$
	D)	$\Theta(n(logn)^2)$
21.	Let S be an NP-complete problem, and Q and R be two other problems not known to be in NP. $Q \leq_p S$ and $S \leq_p R$. Which one of the following statements is TRUE?	
	A)	R is in NP-complete
	B)	R is NP-hard
	C)	Q is NP-complete
	D)	Q is NP-hard
22.	A shift-reduce parser carries out the actions specified by the translation schemes $S \rightarrow xxW\{print$ "1"$\}$ $S \rightarrow y\{print$ "2"$\}$ $W \rightarrow Sz\{print$ "3"$\}$ What is the translation of $xxxxyzz$ using the syntax directed translation scheme described by the above rules?	
	A)	23131
	B)	11233
	C)	11231
	D)	33211
23.	Consider the following grammar $S \rightarrow (S)$	

	$S \rightarrow x$ Which of the following statements is (are) true? i. The grammar is ambiguous ii. The grammar is suitable for top-down parsing iii. The grammar is suitable for bottom-up parsing	
	A)	i. only
	B)	ii. only
	C)	ii. and iii. only
	D)	i., ii., and iii
24.	Consider a grammar G having a pair of productions $A \rightarrow \alpha \mid \beta$, if $First(\alpha) \cap First(\beta) \neq \phi$, then	
	A)	Grammar G is not LL
	B)	Grammar G is LL
	C)	Grammar G may or may not LL
	D)	None of these
25.	The transition function of DFA is a mapping from	
	A)	$Q \times \Sigma \rightarrow Q$
	B)	$Q \times \Sigma \rightarrow 2^Q$
	C)	$Q \times \{\Sigma \cup \varepsilon\} \rightarrow Q$
	D)	$Q \times \{\Sigma \cup \varepsilon\} \rightarrow 2^Q$
26.	Which of the following string is in the language represented by the regular expression $(0^*10^*10^*)^*$?	
	A)	001
	B)	0011101
	C)	1000
	D)	10
27.	Let L be a language recognized by a finite automata. The reversal of language L denoted by L^R	
	A)	Is a regular language
	B)	Is not a regular language
	C)	May or may not be a regular language
	D)	Cannot be determined
28.	Which of the following is annihilator for concatenation operator defined over set of regular languages?	
	A)	ε
	B)	ϕ
	C)	Σ
	D)	L, where L is a regular language
29.	Which of the following operator(s) defined over set of regular languages is(are) idempotent?	
	A)	Union operator
	B)	Concatenation operator
	C)	Both union and concatenation operators
	D)	Neither union operator nor concatenation operator
30.	The language L=$\{0^n \mid n$ is a perfect square$\}$	
	A)	Is a regular language
	B)	Is not a regular language

	C)	May or may not be a regular language
	D)	Cannot be determined
31.	In the language associated with the grammar $S \rightarrow aS \mid bS \mid a$ consists of	
	A)	All the strings that start with a
	B)	All the strings that start with b
	C)	All the strings that end with a
	D)	All the strings that have equal number of a and b
32.	The mathematical model(s) of computation that can accept recursively enumerable languages is(are) i. Finite automaton ii. Push-down automaton iii. Linear bounded automaton iv. Turing machine	
	A)	i. only
	B)	i. and ii.
	C)	i., ii., and iv.
	D)	iv. only
33.	According to Chomsky classification, context-free grammar is	
	A)	Type 0 grammar
	B)	Type 1 grammar
	C)	Type 2 grammar
	D)	Type 3 grammar
34.	The performance of Round Robin (RR) algorithm heavily depends upon	
	A)	Size of the process
	B)	The I/O bursts of the process
	C)	The CPU bursts of the process
	D)	The size of time quantum
35.	Which of the following statement(s) is(are) FALSE regarding a bridge? i. Bridge is a layer 2 device ii. Bridge reduces collision domain iii. Bridge is used to connect two or more LAN segments iv. Bridge reduces broadcast domain	
	A)	i. and ii.
	B)	i. and iii.
	C)	iii. and iv.
	D)	iv. only
36.	HTML is based on	
	A)	SGML
	B)	HTTP
	C)	XML
	D)	None of these
37.	WSDL is	
	A)	Web Services definition language
	B)	Web Services description language
	C)	Web Services design language
	D)	Web Security description language
38.	UML is based on which of the following methodology(ies):	

	i. Booch's methodology ii. Rumbaugh's OMT iii. Jacobson's Objectory	
	A)	i. only
	B)	i. and ii
	C)	i. and iii
	D)	i., ii., and iii
39.	An entity and attribute in ER model are represented respectively by	
	A)	Diamond and Ellipse
	B)	Rectangle and Ellipse
	C)	Ellipse and Rectangle
	D)	Rectangle and Diamond
40.	Which of the following SQL command(s) is(are) NOT part of Data Definition Language (DDL)? i. CREATE ii. ALTER iii. TRUNCATE iv. SELECT	
	A)	ii. and iii
	B)	ii. and iv
	C)	iii. and iv
	D)	iv. only
41.	Which of the following SQL command can be used to add column to a table?	
	A)	SELECT
	B)	INSERT
	C)	ALTER
	D)	CREATE
42.	Which of the following is(are) uncompressed audio file format(s)? i. WAV ii. AIFF iii. AAC iv. MP3	
	A)	i. and ii
	B)	ii. and iii
	C)	iii. and iv
	D)	i. and iii
43.	Data captured as user navigates through a website is called	
	A)	Staged data
	B)	Web-user data
	C)	Time-variant data
	D)	Clickstream data
44.	Which of the following is used to increase security on a client/server network?	
	A)	Bridge
	B)	Bastion host
	C)	Database server
	D)	None of these

45.	A network consisting of devices used by a single person connected via wireless media is a	
	A)	PAN
	B)	LAN
	C)	MAN
	D)	WAN
46.	Internet Protocol version 6 (IPv6) uses	
	A)	32-bit addressing
	B)	64-bit addressing
	C)	128-bit addressing
	D)	256-bit addressing
47.	Javascript	
	A)	Is a server-side scripting language
	B)	Uses the document object model to organize objects and page elements
	C)	Is used to create applets
	D)	Is the same language as Java
48.	Which of the following transmission medium is preferred in an area where electrical or magnetic interference is present?	
	A)	Unshielded twisted-pair
	B)	Shielded twisted-pair
	C)	Coaxial cable
	D)	Fiber-optic cable
49.	Which of the following layer in OSI model is responsible for setting up virtual connection between the sending and receiving devices?	
	A)	Physical layer
	B)	Data link layer
	C)	Network layer
	D)	Transport layer
50.	Which of the following software methodology takes client's feedback and performs testing in every pass of SDLC?	
	A)	Waterfall
	B)	Rapid prototyping
	C)	Agile
	D)	Spiral

Electronics & Communication Engineering(Ph.D.)

1. For the matrix $\begin{vmatrix} 4 & -2 \\ -2 & 1 \end{vmatrix}$, the eigenvalue are

(A) 1 and 4 (B) -1 and 2 (C) 0 and 5 (D) 5 and -1

2. The rank of the matrix $\begin{matrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{matrix}$ is

(A) 0 (B) 1 (C) 2 (D) 3

3. Stroke's theorem connects

(A) A line integral and a surface integral (B) A surface integral and a volume integral

(C) A line integral and a volume integral (D) Gradient of a function and its surface integral

4. Convert 1100101_2 into octal base system.

(A) 145_8 (B) 340_8 (C) 257_8 (D) 150_8

5. The divergence of the vector field $3xz\,\hat{\imath} + 2xy\hat{\jmath} - yz^2\hat{k}$ at a point (1, 1, 1) is equal to

(A) 7 (B) 4 (C) 3 (D) 0

6. The area enclosed between the curve $y^2=4x$ and $x^2=4y$ is

(A) $\frac{16}{3}$ (B) 8 (C) $\frac{32}{3}$ (D) 16

7. The following is not the purpose of modulation:

(A) Multiplexing (B) Effective radiation

(C) Narrow banding (D) Increase in signal power

8. Which of the following modulations is digital in nature?

(A) PPM (B) PAM (C) FM (D) DM

9. The depletion width of a Si p-n junction at a reverse bias of 10 V is 2 μm. When the reverse bias is increased to 20 V, the depletion width will be:

(A) 4.0 μm (B) 3.2 μm (C) 2.8 μm (D) 2.4 μm

10. The Schottky barrier lowering is caused by

(A) The strong force (B) The image force

(C) The gravitation force (D) The inter-atomic force

11. The forward transfer function of a system is $\frac{1}{1+s}$. The steady state error to unit step input when operated as a unity feedback system is:

(A) 10 (B) $\frac{1}{11}$ (C) 0 (D) ∞

12. For signal x(n)=6 cos $\left(\frac{2\pi n}{4}\right)$, the signal power is:

(A) 36 Watts (B) 18 Watts (C) 72 Watts (D) 54 Watts

13. A function sampled at Nyquist rate $f_s=2f_o$. The function can be recovered from its samples only if it is a/an:

(A) Sine wave of frequency f_o

(B) Triangular wave of fundamental frequency f_o

(C) Periodic square wave of fundamental frequency f_o

(D) Unit step function

14. N-channel FETs are preferred to p-channel FETs because
(A) Holes have higher velocity
(B) Electrons have higher mobility than holes
(C) Electrons have higher diffusivity than holes
(D) Electrons have higher effective mass than holes

15. The inverse Fourier Transform of the function
$F(\omega) = \frac{1}{j\omega} + \pi\,\delta\,(\omega)$ is
(A) sin ωt (B) cos ωt (C) sgn (t) (D) u(t)

16. An AM wave is given by
$S_{AM}(t) = 10\,(1+0.4\cos 10^3 t + 0.3\cos 10^4 t)\cos 10^6 t$. The modulation index is:
(A) 0.4 (B) 0.5 (C) 0.3 (D) 0.9

17. 10 signals, each band-limited to 5 KHz are to be transmitted over a single channel by frequency division multiplexing. If AM-SSB modulation guardband of 1 KHz is used then the bandwidth of the multiplexed signal will be:
(A) 79 KHz (B) 60 KHz (C) 59 KHz (D) 61 KHz

18. Pinch-off is the situation when
(A) The drain current is zero
(B) No more free carriers are available for conduction
(C) The drain current starts reducing
(D) Electrons and holes are completely recombined

19. A signal X(t) = 100 cos (2 π X10^3) t is ideally sampled with sampling period of 50 μ sec and then passed through an ideal low pass filter with cut off frequency of 15 KHz. Which of the following frequencies is/are present at the filter output?
(A) 12 KHz only (B) 8 KHz only
(C) 12 KHz and 9 KHz (D) 12 KHz and 8 KHz

20. For a shortwave radio link between two stations via the ionosphere. The ratio of the maximum usable frequency to the critical frequency:
(A) Is always less than 1
(B) Is always greater than 1
(C) May be less than or more than one depending upon the distance between two stations
(D) Doesn't depend on the distance between the two stations

21. A solar cell operates in:
(A) Photo conductive mode (B) Photo resistive mode
(C) Photo transmitive mode (D) Photo voltaic mode

22. In a twin wire transmission line in air the adjacent voltage maxima are at 12.5 cm and 27.5 cm. The operating frequency is :
(A) 300 MHz (B) 1 GHz (C) 2 GHz (D) 6.28 GHz

23. The depth of the penetration of a wave in a lossy dielectric increases with increasing :
(A) Conductivity (B) Permeability (C) Wavelength (D) Permittivity

24. Poynting vector signifies :
(A) Current density vector producing electrostatic field
(B) Power density vector producing electromagnetic field

(C) Current density vector producing electromagnetic field
(D) Power density vector producing electrostatic field

25. The magnitude of open circuit and short circuit input impedances of a transmission line are 100 Ω and 25 Ω respectively. The characteristic impedance of the line is:
(A) 25 Ω (B) 50 Ω (C) 75 Ω (D) 100 Ω

26. The transmission line is distortion less if:
(A) $RL = \frac{1}{GC}$ (B) RL=GC (C) LG=RC (D) RG=LC

27. The technique OTDR (Optical time domain reflectometry) is used for the measurement of :
(A) Bandwidth (B) Core diameter (C) Attenuation (D) Cladding diameter

28. A CE transistor amplifier is preferred because of
(A) High-input impedance (B) Low-output impedance
(C) Low-current gain (D) High-voltage gain

29. Maximum direct energy band gap is in :
(A) GaAs (B) InAs (C) InSb (D) GaSb

30. Which of the following circuit has the best bias stabilization?
(A) Fixed bias (B) Self-bias
(C) Collector feedback bias (D) Voltage divider bias

31. Heating in a microwave oven is due to:
(A) Magnetostriction (B) Electrostriction
(C) Eddy current (D) Spontaneous polarization

32. An amplifier has a gain of 100. 1% of the output is applied as a negative feedback. The new gain of the feedback is:
(A) 90 (B) 50 (C) 99 (D) 95

33. The permeability and permittivity of a medium are:
(A) Independent to each other (B) Related by the velocity of EM waves
(C) Related to the Boltzman constant (D) Related to Fermi dirac distribution

34. The Bragg's equation for X-ray diffraction from crystal planes is given by:
(A) $d = \frac{n\lambda}{2}\sin\theta$ (B) $n\lambda = 2\,d\sin\theta$
(C) $\lambda = \frac{2dn}{sin\theta}$ (D) $\lambda = \sin\theta + 1$

35. The type of access used in GSM technology is……..
(A) FDMA/TDMA (B) CDMA (C) OFDMA (D) FM

36. Bluetooth uses _____method in the physical layer to avoid interference from other devices or other networks.
(A) DSSS (B) FHSS (C) FDMA (D) OFDM

37. During transmission over a communication channel, bit errors occur independently with probability p. If a block of n bits is transmitted, the probability of at most one bit error is equal to
(A) $1-(1-p)^n$ (B) $p+(n-1)(1-p)$ (C) $np(1-p)^{n-1}$ (D) $(1-p)^n + np(1-p)^{n-1}$

38. At a given probability of error, binary coherent FSK is inferior to binary coherent PSK by
(A) 6 dB (B) 3dB (C) 2 dB (D) 0 dB

39. I_c the dc collector current of a BJT = 2 mA at room temperature where kT/q=25 mV. Given h_{fe}=100, the value of h_{ie} is given by:
(A) 125 Ω (B) 25 Ω (C) 1250 Ω (D) 2500 Ω

40. Consider the sequence of 8085 instructions given below

LXI H,9258	MOV A,M
CMA	MOV M,A

Which one of the following program is performed by this sequence?
(A) Contents of location 9258 are moved to the accumulator
(B) Contents of location 9258 are compared with the contents of the accumulator
(C) Contents of location 8259 are complemented and stored in location 8529
(D) Contents of location 5892 are complemented and stored in location 8982

41. Which one of the following is not a vectored interrupt?
(A) TRAP (B) INTR (C) RST 7.5 (D) RST3

42. The following program starts at location 0100 H

LXI SP, 00FF	LXI H,0701 H
MVI A,20 H	SUB M

The content of the accumulator when the program counter reaches 0109 H is
(A) 20 H (B) 02 H (C) 00 H (D) FF H

43. A Hilbert transformer is a
(A) Non-linear system (B) Non-causal system
(C) Time –varying system (D) Low-pass system

44. _____ is a preferred sampling method for the population with finite size.
(A) Systematic sampling (B) Purposive sampling
(C) Cluster sampling (D) Area sampling

45. A null hypothesis is
(A) Subjective in nature
(B) The same as research hypothesis
(C) When there is difference between the variables
(D) When there is no difference between the variables

46. Books and records are the primary sources of data in:
(A) Clinical research (B) Historical research
(C) Laboratory research (D) Participatory research

47. To test null hypothesis, a researcher uses:
(A) χ *test* (B) t test (C) ANOVA (D) Factorial analysis

48. Which one is called non-probability sampling?
(A) Quota sampling (B) Cluster sampling
(C) Systematic sampling (D) Stratified random sampling

49. An important impairment to digital signals in a communication system is the irregularities in timing caused by imperfections in clock extraction and waveform regeneration. This effect is known as _____.
(A) Jitter (B) Aliasing (C) Fading (D) Attenuation

50. Viterbi decoding is one of the most commonly used techniques in modern system that is used to decode the data encoded by _____.

(A) Convolutional Coding (B) CRC coding

(C) Block Coding (D) Hamming coding

x-x-x

Food Technology(Ph.D)

1. The main constituent of vegetable oils are the fatty acids of carbon chain
(A) C_4 to C_{16} (B) C_{14} to C_{16} (C) C_{16} and C_{18} (D) C_8 and C_{20}

2. The proportion of endosperm in brown rice vary in the range from
(A) 79-84% (B) 50-60% (C) 90-95% (D) 70-80%

3. Wheat kernel is round on the
(A) Dorsal side (B) Ventral side (C) On both sides (D) One side

4. Preparation of sweet coated breakfast cereals like corn flakes includes several major processing steps like
P: Soaking in water followed by steaming of corn grits
Q: Coating of sugar followed by drying of flakes
R: Breaking the whole corn into large grits
S: Flaking of cooked grits
T: Packaging of finished product
U: Toasting of flakes
V: Cleaning of whole corn
The correct sequence for the preparation of sugar coated corn flakes is
(A) V-U-Q-P-S-R-T (B) V-R-S-P-U-Q-T (C) V-U-P-Q-S-R-T (D) V-R-P-S-U-Q-T

5. The saccharifying enzyme is
(A) α-amylase (B) β-amylase (C) Xylanase (D) Peroxidise

6. Denaturation of proteins means
(A) Loss of primary structure

(B) Loss of three dimensional structure

(C) De polymerization

(D) Coagulation

7. The storage proteins of cereals are
(A) Albumin and Globulins (B) Globulin and Glutenins

(C) Glutenins and prolamins (D) Polyamines and albumins

8. The sweetness of HFS (DE: 95-96%) with respect to sucrose taken as one is
(A) 1.5 (B) 2.0 (C) 1.8 (D) 3.0

9. The empirical formula for the carbohydrate is
(A) $C_n(H_2O)_n$ (B) $C_n(H_2O)_{2n}$ (C) $C_n(H_2O)_{n+1}$ (D) $C_n(H_2O)_{n-1}$

10. Oligosaccharides are the carbohydrates having number of monomeric units ranging from
(A) 1-5 (B) 2-5 (C) 2-20 (D) 2-30

11. One ton of refrigeration means one of the following options:
(A) Cooling provided by one kg of ice in one hour

(B) Cooling provided by one ton of ice in one hour

(C) Energy extracted to freeze one ton of water in one day

(D) Coefficient of performance is unity

12. Hemicelluloses are also known as
(A) Lignin (B) D-Galactose (C) β-glucans (D) Pentosans

13. In the extruder barrel, the compression is achieved by back pressure created by the die and by
(A) Increasing pitch and decreasing diameter of the screw
(B) Using the tapered barrel with constant pitch
(C) Increase in the clearance between barrel surface and screw
(D) Opening of the die

14. Water activity of the solution having low solute concentration can be obtained from
(A) $a_w = X_w$ (B) $a_w = L_n X_w$ (C) $L_n a_w = X_w$ (D) $a_w = 1/X_w$

15. Calculate the refrigeration load when 100kg/h of peas needs to be frozen from 30˚C to -40˚C. The peas have a moisture content of 74%.
(A) 11.42 KW (B) 43.78 KW (C) 4.11×10^7 J/h (D) 43.78×10^6 J/h

16. When the partial vapour pressure of the surroundings equal to the vapour pressure of the moisture in the solids, it is in a state of
(A) High RH (B) Low RH
(C) Equilibrium relative humidity (D) Equilibrium moisture content

17. China, India, Indonesia, Bangladesh are the major producer of
(A) Mango (B) Poultry (C) Rubber (D) Paddy

18. The value of Reynolds number bellow ------- is laminar flow
(A) 2100 (B) 4200 (C) 4000 (D) 2100 to 4000

19. 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 (Lathyrus sativus)
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

20. Maize is deficient in
(A) Protein only (B) Iron only
(C) Carbohydrate (D) Lysine, Methionine, Tryptophan

21. F value at 121˚C equivalent to 99.999% inactivation of a strain of *C. botullinum* is 1.2 min. D_0 value of this organism is
(A) 0.43 min (B) 0.24 min (C) 0.65 min (D) 0.12 min

22. Drying mode commonly used in all types of cereal grain is
(A) Radiation (B) Conduction (C) Convection (D) Vacuum

23. Tea is related with the term
(A) Leaching (B) Distillation (C) Rheology (D) Extraction

24. The winterization is done to remove
(A) Colour (B) Gums
(C) Waxes and saturated fatty acids (D) Flavour

25. Moisture content of potato is 85% wet basis. In dry basis the value will be
(A) 333% (B) 155% (C) 566.6% (D) 444%

26. The door to a refrigerated room is 3.048 m high and 1.83 m wide. It is opened and closed at least five times each hour and remains open for at least 1 min at each opening. Calculate the refrigeration load due to the door opening if the room is maintained at 0˚C and ambient temperature is 29.4˚C.
(A) 30.9 MJ (B) 35.58 MJ (C) 76.89 MJ (D) 45.85 MJ

27. Deodorisation of oil is carried out by
(A) Steam distillation (B) Evaporation
(C) Fractionation (D) Drying

28. Yield stress' term is related with
(A) Leaching (B) Distillation (C) Rheology (D) Extraction

29. Make the correct combination of underlying principles in **Group** I with the processes in **Group** II

Group I	**Group II**
P. Gelatinization	1. Carbonyl derivatives react with free amino acids to yield aldehydes
Q. Strecker degradation	2. Starch aggregates and forms micro-crystals
R. Caramelization	3. Starch granules swell and leach amylose
S. Retrogradation	4. Pyranose or furanose rings open up by pyrolytic reactions to form furfural derivatives

(A) P-3, Q-1, R-4, S-2 (B) P-3, Q-1, R-2, S-4
(C) P-1, Q-2, R-3, S-4 (D) P-1, Q-3, R-4, S-2

30. Hypobaric storage is also known as _____
(A) Modified atmospheric storage (B) Controlled atmospheric storage
(C) Low pressure storage (D) Modified aseptic package

31. Shear thining liquid is also known as
(A) Dilatants fluid (B) Pseudoplastic fluid
(C) Newtonian fluid (D) Cassion plastic

32. Physical hardness of which cereal grain is highest
(A) Rice (B) Jawar (C) Millet (D) Corn

33. The principle nutrients which get increased in the parboiled rice include
(A) Thiamine alone (B) Thiamine and phosphorous
(C) Thiamine, niacin and iron (D) Iron and vitamin

34. Kirchhoff's law is related to
(A) Heat transfer (B) Mass transfer (C) Fluid mechanics (D) Extraction

35. Triple point of water is
(A) 0.00098˚C and 76 mm Hg (B) 0.98˚C and 760 mm Hg
(C) 0.098˚C and 760mm Hg (D) 0.0098˚C and 4.8 mm of mercury

36. Orifice meter is used to measure
(A) Fluid flow (B) Heat transfer (C) Air pressure (D) Particle size

37. The pump which is used for lifting/pumping water or liquid from deep well is called
(A) Centrifugal pump (B) Piston pump (C) Air lift pump (D) Spur gear pump

38. The pump which is used to transport different fluids to different height to increase the potential energy.
(A) Centrifugal pump (B) Piston pump
(C) Air lift pump (D) Spur gear pump

39. The rate of heat loss through a stainless steel slab 10 cm thick which is maintained at 100˚C on hot side and 30˚C on the cold side. The thermal conductivity of steel is 16.37 W/m˚C.
(A) 11.459kW/m^2 (B) 111.675 kW/m^2 (C) 34.56 kW/m^2 (D) 23.49kW/m^2

40. Lecithin is the by-product of
(A) Edible Oil refining industry (B) Sugar Industry
(C) Meat processing industry (D) Canning industry

41. Hypobaric storage is also known as _____
(A) Modified atmospheric storage (B) Controlled atmospheric storage
(C) Low pressure storage (D) Modified aseptic package

42. Which one of the following is NOT a source of caffeine?
(A) Coffee (B) Cocoa beans (C) Corn syrup (D) Tea leaves

43. Which of the following carbohydrates is NOT classified as dietary fibre?
(A) Agar (B) Pectin (C) Sodium alginate (D) Tapioca starch

44. In the extruder barrel, the compression is achieved by back pressure created by the die and by
(A) Increasing pitch and decreasing diameter of the screw
(B) Using the tapered barrel with constant pitch
(C) Increase in the clearance between barrel surface and screw
(D) Opening of the die

45. Rheologicallly Tomato Ketch up, toothpest are
(A) Dilatant fluid (B) Pseudoplastic fluid
(C) Newtonian fluid (D) Cassion plastic

46. The ratio of molecular diffusion of momentum to molecular diffusion of mass is called
(A) Biot number (B) Schmidst number
(C) Grashof number (D) Sherwood number

47. ------- law describe molecular diffusion.
(A) Kick law (B) Power Law (C) Fick's law (D) Henry's law

48. 100 kWh is equal to
(A) 7.2x10^8 J (B) 3.6x 10^8 J (C) 8.3x 10^8 J (D) 6.5x 10^8 J

49. A microbial kill of 99.99% is equivalent to
(A) 2 log cycle (B) 4 log cycle (C) 6 log cycle (D) 3 log cycle

50. Which one is not the by-product of oil industry?
(A) Tocopherol (B) Bleaching earth (C) Pectin (D) Soap stock

Industrial Chemistry(Ph.D)

1. The value of $\int_0^1 \frac{dx}{1+x}$ by Simpson's rule is

A) 0.96315
B) 0.63915
C) 0.69315
D) 0.96513

2. The value of $\Delta^{10}\left[(1-ax)\left(1-bx^2\right)\left(1-cx^3\right)\left(1-dx^4\right)\right]$ is

A) –abcd
B) abcd
C) =0
D) abcd (10!)

3. The order of convergence of Newton-Raphson method is

A) 2
B) Linear
C) Slow
D) 1.66

4. Which of the following is a predictor-corrector method:

A) Picard's
B) Runge-Kutta
C) Taylor series
D) Milne's

5. $L^{-1}\left(\frac{1}{s^n}\right)$ is possible only when n is

A) Zero
B) Negative integer
C) Positive integer
D) Negative rational

6. $L^{-1}\left(\frac{1}{s(s^2+1)}\right)$ is

A) 1+ sint
B) 1 - sint
C) 1 + cost
D) 1 - cost

7. Particular integral of $\left(D^2-D'^2\right)z=\cos(x+y)$ is

A) $x\cos(x+y)$
B) $\frac{x}{2}\cos(x+y)$
C) $x\sin(x+y)$
D) $\frac{x}{2}\sin(x+y)$

8. The solution of $xp + yq = z$ is

A) $f\left(x^2, y^2\right) = 0$

B) $f(xy, yz)$

C) $f(x, y) = 0$

D) $f\left(\frac{x}{y}, \frac{y}{z}\right) = 0$

9. With increase in temperature, the surface tension of water

A) Increases

B) Decreases

C) Remains constant

D) Increases linearly

10. Unit of viscosity in CGS system is

A) gm .cm^{-1} sec^{-1}

B) gm . cm^2 . sec^{-2}

C) gm .cm^{-2}, sec^{-1}

D) gm . cm . sec^{-1}

11. The heat transfer by radiation from a mild steel surface is to be reduced by reducing the emissivity of the surface. This can be best achieved by

A) Painting the surface black

B) Painting the surface white (with aluminium paint)

C) Giving the surface a mirror finish

D) Roughening the surface

12. As the difference between the wall temperature and bulk temperature increases, the boiling heat transfer co-efficient

A) Continues to increase

B) Continues to decrease

C) Goes through a minimum

D) Goes through a maximum

13. Which of the following has the highest thermal conductivity?

A) Brick

B) Air

C) Water

D) Silver

14. Deairation (removal of O_2) of water is done by

A) Rectification

B) Absorption

C) Ion-exchange

D) Adsorption

15. The reciprocal of stripping factor is termed as

A) Selectivity index

B) Relative volatility

C) Absorption factor

D) Murphree efficiency

16. Urea is represented as

A) $NH_2.CO.NH_2$

B) $NH_3CO.CH_3$

C) $NH.CO_2.NH$

D) $NH_3.CO_2.NH_3$

17. Fertiliser plants get their N_2 requirements

A) By fractionation of liquified air

B) By dissociating oxides of nitrogen

C) From coal gas (coke oven gas)

D) From producer gas

18. Solutions which distil without change in composition are called

A) Ideal

B) Saturated

C) Supersaturated

D) Azeotropic

19. Gases diffuse faster compared to liquids because of the reason that the liquid molecules

A) Are held together by stronger inter-molecular forces

B) Move faster

C) Have no definite shape

D) Are heavier

20. Internal energy change of a system over one complete cycle in a cyclic process is

A) Zero

B) +ve

C) -ve

D) Dependent on the path

21. No work is done by the system, when a reaction occurs at constant

A) Volume

B) Temperature

C) Pressure

D) None of these

22. Boyle's law for gases states that

A) $P \propto \frac{1}{V}$, when temperature is constant

B) $P \propto \frac{1}{V}$, when temperature & mass of the gas remain constant

C) $P \propto V$, at constant temperature & mass of the gas

D) $\frac{P}{V}$ = constant, for any gas

23. Which of the following is a thermodynamic property of a system?

A) Concentration

B) Mass

C) Temperature

D) Entropy

24. Coke oven gas consists mainly of

A) H_2, & CH_4

B) CO, & CO_2

C) H_2, & CO

D) CH_4, & CO

25. The gas which contributes maximum to the heating value of natural gas is

A) CO

B) CO_2

C) H_2

D) CH_4

26. The ratio of shear stress to shear strain is called

A) Bulk modulus

B) Shear modulus

C) Modulus of rigidity

D) Modulus of elasticity

27. Due to its excellent permeability to air/gas and oxidation resistance, the tubes of automobile tyres is made of

A) Cold SBR
B) Butyl rubber
C) Bunai N
D) Buna S

28. Addition of stabiliser during PVC manufacture is done to

A) Improve its impact strength

B) Improve its elasticity

C) Reduce the melt viscosity & glass transition temperature

D) Prevent its thermal degradation

29. Flexible foam (for mattresses) are usually made of

A) PVC

B) Silicone rubber

C) Polyurethanes

D) Polyamides

30. Which of the following is stretched into fibres?

A) Saturated polyester

B) Unsaturated polyester

C) Isoprene

D) Bakelite

31. The fluid property, due to which, mercury does not wet the glass is

A) Surface tension

B) Viscosity

C) Cohesion

D) Adhesion

32. The head loss in turbulent flow in a pipe varies

A) As velocity

B) As (velocity)^2

C) Inversely as the square of diameter

D) Inversely as the velocity

33. The velocity profile for turbulent flow through a closed conduit is

A) Logarithmic

B) Parabolic

C) Hyperbolic

D) Linear

34. Dimension of absolute viscosity is

A) $ML^{-1}T^{-1}$

B) MLT^{-1}

C) $ML^{-1}T$

D) MLT

35. A perfect gas

A) Does not satisfy $PV = nRT$

B) Is incompressible and has zero viscosity

C) Has constant specific heat

D) Can't develop shear stresses

36. Reciprocating pumps are not able to compete with the centrifugal pump for industrial use, mainly because these pumps have

A) Very low speeds
B) Smaller discharge
C) Higher capital &maintenance cost
D) High vibrations

37. The pressure head of a flow meter remains constant for

A) Venturimeter

B) Orificemeter

C) Rotameter

D) Pitot tube

38. Diatomaceous earth is a/an

A) Explosive

B) Filter aid

C) Filter medium

D) Catalyst

39. Gravity settling process is not involved in the working of a

A) Hydrocyclone

B) Classifier

C) Dorr-thickener

D) Sedimentation tank

40. Balls for ball mills are never made of

A) Forged/cast steel

B) Lead

C) Cast iron

D) Alloy steel

41. Which is the most undesirable component in kerosene?

A) Aromatics

B) *i*-paraffins

C) *n*-paraffins

D) Naphthenes

42. Stabilisation of gasoline (petrol) means

A) Removal of dissolved gases from it

B) Increasing its oxidation stability

C) Improving its lead susceptibility

D) Increasing its vapour pressure

43. Reforming converts

A) Olefins into paraffins

B) Naphthenes into aromatics

C) Naphthenes into olefins

D) Naphthenes into paraffin

44. Which of the following sugars is the sweetest?

A) Glucose

B) Fructose

C) Sucrose

D) Lactose

45. All enzymes are made of

A) Fats

B) Carbohydrates

C) Proteins

D) Amino acids

46. Which oil is preferred for paint manufacture?

A) Drying oil

B) Non-drying oil

C) Semi-drying oil

D) Saturated oil

47. Rancidity of the fatty oil can be reduced by its

A) Decoloration

B) Hydrogenation

C) Oxidation

D) Purification

48. Chloramines are used in water treatment for

A) Disinfection and control of taste & odour

B) Corrosion control.

C) Removing turbidity

D) Control of bacteria

49. Persons working in cement plants and limestone quarries are more prone to disease like

A) Cancer

B) Asthma

C) Silicosis

D) Flourosis (bone disease)

50. Which is a secondary air pollutant?

A) Photochemical smog

B) Sulphur dioxide

C) Nitrogen dioxide

D) Dust particles

x-x-x

Information & Technology Engineering

1. A statistical test used to determine whether a correlation coefficient is statistically significant is called the _____.

A) One-way analysis of variance
B) t-test for independent samples
C) Chi-square test for contingency tables
D) t-test for correlation coefficients

2. A complete n-ary tree is a tree in which each node has n children or no children. Let I be the number of internal nodes and L be the number of leaves in a complete n-ary tree. If L=41, I=10, what is the value of n

A) 3 B) 4 C) 5 D) 6

3. Booth's algorithm for larger multiplication gives worst performance when the multiplier pattern is

A) 101010....1010 B) 1000....0001 C) 1111....1111 D) 0111...1110

4. What do we call data on a continuous scale with a neutral zero?

A) Ratio data B) Interval Data C) Nominal Data D) Categorical Data

5. In relational databases, the physical location of a record is determined by a mathematical formula that transforms a file key into a record location in a

A) Tree file B) Indexed file C) Hashed file D) Sequential file

6. Given the mean weight of 500 students is 75 kgs and standard deviation is 7 kgs. Assuming the weights are normally distributed, how many students weigh between 60 and 78 kgs?

A) 339 B) 400 C) 349 D) 350

7. Investigate for what values of a,b the simultaneous equations have a unique solution

$x+y+z=6$
$x+2y+3z=10$
$x+2y+az=b$

A) $a\neq3$ B) $a>3$ C) $a=3$ D) $a<3$

8. Consider a connected planar graph with n vertices and e edges, then number of regions is equal to

A) e-n-4 B) e+n C) e-n+2 D) e-n+1

9. Relation R with an associated set of functional dependencies F, is decomposed into BCNF. The redundancy in the resulting set of relations is

A) Indeterminate
B) Proportional to size of F^+
C) Zero
D) Greater than zero but less than size of equivalent 3 NF decomposition

10. How many passes would be needed to sort a list of 8 items using Bubble Sort?

A) 7 B) 8 C) 6 D) 2

11. What is the output of the following:

```
main()
{
        int a = 10, b= 10,
        printf ("ans = % d", a > b ? a * a; b/b);
}
```

A) ans = 100 B) ans = 0 C) ans = 1 D) Error

12. When a number is added to an address to obtain a new address, it is known as

A) Indirect addressing B) Indexing
C) Direct addressing D) Indexing addressing

13. Which data structures are typically used to represent matrices:

A) Linked lists B) Pointers C) Strings D) Arrays

14. Assuming main memory to be 4 KB and page size 1KB, using Least Frequently Used algorithm for page replacement, what pages should reside in main memory at the end for following sequence of page references: 4, 8, 2, 3, 2, 8, 3, 1, 2, 6, 7

A) 2, 4, 7, 8 B) 7, 8, 2, 3 C) 1, 2, 6, 7 D) 1, 2, 3, 8

15. The subnet mask for a particular network is 255.255.31.0. Which of the following pairs of IP addresses could belong to this network?

A) 172.57.88.62 and 172.56.87.233 B) 10.35.28.2 and 10.35.29.4
C) 191.203.31.87 and 191.234.31.88 D) 128.8.129.43 and 128.8.161.55

16. Consider a queue that is implemented using stacks, what are the time complexities of enqueue and dequeue operations?

A) O(1), O(n) B) O(n), O(n) C) O(1), O(1) D) O(n), O(1)

17. In how many ways can 12 students be divided into 4 teams, so that each team contains 3 students?

A) 15400 B) 369600 C) 600369 D) 40015

18. Consider Z=X-Y, where X, Y, Z are all in sign-magnitude form. X and Y are each represented in n bits. To avoid overflow, the representation of Z would require a minimum of

A) n bits B) n-1 bits C) n+2 bits D) n+1 bits

19. Consider a system with 3 processes and 4 shared resource instances. Each process can request a maximum of k number of instances. Resource instances are requested and released one at a time. The largest value of k that will always avoid a deadlock is:

A) 4 B) 2 C) 3 D) 1

20. The regular expression 0*(10*)* denotes the same set as

A) (!*0)*1* B) 0 + (0 + 10)* C) (0 + 1)*10(0 + 1)* D) (0 + 10)*

21. In hypothesis testing, a Type I error is said to occur when

A) A false null hypothesis is not rejected by researcher
B) A true null hypothesis gets rejected by researcher
C) Researcher fails to make a decision about null hypothesis
D) Chosen level of significance is too low

22. What is the size of an IPv6 address?
A) 32 bits B) 64 bits C) 128 bits D) 256 bits

23. An Internet specific protocol that specifies how low-power compute-constrained devices can operate in the internet of things (IoT) and that is gaining importance in utility field area networks is:
A) CoAP B) MTTQ C) UDP D) SSDP

24. In asymmetric key cryptography, the private key is kept by
A) Sender B) Receiver
C) Sender and receiver D) All the connected devices to the network

25. Below are the 8 actual values of target variable in the train file.
[0,0,0,1,1,1,1,1]
What is the entropy of the target variable?
A) -(5/8 log(5/8) + 3/8 log(3/8)) B) 5/8 log(5/8) + 3/8 log(3/8)
C) 3/8 log(5/8) + 5/8 log(3/8) D) 5/8 log(3/8) – 3/8 log(5/8)

26. Which one out of the following is not an agile software methodology
A) Spiral model B) Extreme Programming
C) Scrum D) Lean Software Development

27. Karnaugh map is used to
A) Minimize the number of flip flops in a digital circuit
B) Minimize the number of gates only in a digital circuit
C) Minimize the number of gates and fan-in of a digital circuit
D) Design gates

28. In a microprocessor, the address of the next instruction to be executed is stored in the
A) Stack pointer B) Address latch
C) Program counter D) General purpose register

29. The maximum number of edges in a n-node undirected graph without self loops is
A) n^2 B) n (n-1) / 2 C) n-1 D) (n+1)(n) / 2

30. Consider the following schedule involving two transactions. Which one of the following statements is true?
S_1: $r_1(X)$; $r_1(Y)$; $r_2(X)$; $r_2(Y)$;$w_2(Y)$;$w_1(X)$
S_2: $r_1(X)$; $r_2(X)$; $r_2(Y)$;$w_2(Y)$; $r_1(Y)$; $w_1(X)$
A) Both S_1 and S_2 are conflict serializable
B) S_1 is conflict serializable but not S_2
C) S_1 is not conflict serializable but S_2 is conflict serializable
D) Both S_1 and S_2 are not conflict serializable

31. The following postfix expression with single digit operands is evaluated using a stack
8 2 3 ^ / 2 3 * + 5 1 * -
The top two elements of the stack after the first * is evaluated are:
A) 6,1 B) 5,7 C) 3,2 D) 1,5

32. If a fair coin is tossed four times, what is the probability that two heads and two tails will result?
A) 3/8 B) 5/8 C) 1/2 D) 3/4

33. What does the following C-statement declare?
int (* f) (int *);
A) A function that takes an integer pointer as argument and returns an integer
B) A function that takes an integer as argument and returns an integer pointer
C) A pointer to a function that takes an integer pointer as argument and returns an integer
D) A function that takes an integer pointer as argument and returns a function pointer

34. Which of the following terms refers to a deployment model in which an application runs in an enterprise's private cloud or data center but uses public cloud resources to support spikes in user demand?

A) Cloud spiking
B) Cloud bursting
C) Cloud bubble
D) Cloud blasting

35. The use of a DTD in XML development is:
A) Required when validating XML documents
B) No longer necessary after the XML editor has been customized
C) Used to direct conversion using an XSLT processor
D) A good guide to populating a templates to be filled in when generating an XML document automatically

36. Hadoop is a framework that works with a variety of related tools. Common cohorts include:
A) MapReduce, Hive and HBase
B) MapReduce, MySQL and Google Apps
C) MapReduce, Hummer and Iguana
D) MapReduce, Heron and Trumpet

37. Which of the following transport layer protocols is used to support electronic mail?
A) SMTP B) IP C) TCP D) UDP

38. The values GET, POST, HEAD etc are specified in _____ of HTTP message
A) Request line B) Header line C) Status line D) Entity body

39. Network slicing is a network management feature that 5G will allow. What does this mean users can have?
A) The ability to set up multiple connection points to one 5G network
B) The ability to create multiple virtual networks within a single 5G network
C) The ability to designate multiple passwords for one 5G network
D) The ability to utilize connections from other nearby networks

40. The greatest negative number that can be stored in a computer that has 8-bit word length and uses 2's complement arithmetic is
A) -256 B) -225 C) -128 D) -127

41. Consider a direct mapped cache of size 32 KB with block size 32 bytes. The CPU generates 32 bit addresses. The number of bits needed for cache indexing and the number of tag bits are respectively:
A) 10, 17 B) 10, 22 C) 15, 17 D) 5, 17

42. In digital image processing, the intensity on richness of a color is known as its
A) Hue B) Saturation C) Luminance D) Brightness

43. A post hoc test is ___.
A) A test to compare two or more means in one overall test
B) A test to determine regression to the mean
C) A follow-up test to the analysis of variance when there are three or more groups
D) A follow-up test to the independent t-test

44. In a piezoelectric strain transducer voltage developed is _____ to strain applied.
A) Directly proportional B) Inversely proportional
C) Equal D) Independent

45. Which one of the following is TRUE?
A) The requirements document also describes how the requirements that are listed in the document are implemented efficiently.
B) Consistency and completeness of functional requirements are always achieved in practice.
C) Prototyping is a method of requirements validation.
D) Requirements review is carried out to find the errors in system design

46. The difference between the mean of a researcher's sample and the mean of the population of the sample is known as the:
A) Confidence interval B) Sampling error
C) Significance level D) Standard deviation

47. The huge number of devices connected to the Internet of Things has to communicate automatically, not via humans. What is this called?
A) Skynet B) Bot 2 Bot
C) Machine 2 Machine D) Intercloud

48. Which of the following is not a White box technique?
A) Statement Testing B) Decision Testing
C) Condition Coverage D) Equivalence Partitioning

49. Consider an arbitrary set of CPU-bound processes with unequal CPU burst lengths submitted at the same time to a computer system. Which one of the following process scheduling algorithms would minimize the average waiting time in the ready queue?
A) Shortest remaining time first
B) Round-robin with time quantum less than the shortest CPU burst
C) Uniform random
D) Highest priority first with priority proportional to CPU burst length

50. In a corpus of N documents, one document is randomly picked. The document contains a total of T terms and the term “data” appears K times.
What is the correct value for the product of TF (term frequency) and IDF (inverse-document-frequency), if the term “data” appears in approximately one-third of the total documents?
A) KT * Log(3) B) K * Log(3) / T
C) T * Log(3) / K D) Log(3) / KT

x-x-x

Mechanical Engineering(Ph.D.)

1. Specific heat at constant volume is:

A) Rate of change of internal energy with respect to absolute temperature at constant volume

B) Rate of change of internal energy with respect to absolute pressure at constant volume

C) Rate of change of energy with respect to temperature change at normal volume

D) Change of internal energy at absolute temperature and at constant volume

2. The property of a substance is given as, Internal energy=186 + 0.718 * (Temperature). Internal energy is in KJ/kg and Temperature is in ^{0}C. Specific hear at constant volume will be:

A) 186 KJ/Kg B) 718 KJ/Kg C) 0.718 KJ/Kg D) 0.186 KJ/Kg

3. The property of a substance is given as, Internal energy=186 + 0.718 * (Temperature). Pressure*Specific volume=0.287(Temperature). Internal energy is in KJ/kg and Temperature is in ^{0}C. Specific hear at constant pressure will be:

A) 1.005 Kg/KJ K B) 0.25

C) 0.25 KJ/Kg K D) 1.005 KJ/Kg K

4. For an isochoric process, heat supplied to a closed system is equal to:

A) Mass * Specific heat at constant volume * (Final temperature)

B) Mass * Specific heat at constant volume / (Final temperature-Initial temperature)

C) Specific heat at constant volume * (Final temperature-Initial temperature)

D) Mass * Specific heat at constant volume * (Final temperature-Initial temperature)

5. A closed system experiences an isobaric process in which volume doubles. Work done will be

A) Pressure * Final Volume B) Pressure*Initial Volume*2

C) Pressure*Final volume*2 D) Pressure*Initial Volume

6. In a constant temperature process, volume doubles. Final pressure will become:

A) Cannot say B) Half of initial pressure

C) Double of initial pressure D) Four times of initial pressure

7. A Polytropic process is a thermodynamic process that obeys the relation:

A) P/V^n=Constant B) PV^n=Constant

C) PVn=Constant D) VP^n=Constant

n is polytropic index. P is pressure and V is volume.

8. Water enters a pipe of cross-section 1 m^2 at 1m/s and leaves pipe at cross-section 0.6 m^2. Velocity of water at exit will be:

A) 4 m/sec B) 1.67 m/sec C) 2 m/sec D) 1.4 m/sec

9. Consider steady flow of water in a pipe. At first section velocity is 1 m/sec and height from datum is 1 m. At second section velocity is 0.1 m/sec. There is no work or heat transfer. Ignore changes in enthalpy. Height from datum in second section will be:

A) 10 m B) 20 m C) 1.05 m D) 100 m

10. A heat engine extracts 100 Joules from a Source and does 73 Joules of work. Heat rejected to the Sink will be:

A) 72 Joules B) 27 Joules C) 50 Joules D) 0.73 Joules

11. A heat pump consumes 100 Joules of work to push 120 Joules into a body at high temperature. Amount of heat extracted from a body at low temperature will be:

A) 12 Joules B) 1.2 Joules C) 20 Joules D) 100 Joules

12. A heat engine extracts 90 Joules from a body at high temperature and rejects 80 Joules into a body at low temperature. Thermal efficiency will be:

A) 21% B) 7% C) 11 % D) 9%

13. Main component of CNG is:

A) Methane B) Ethane C) Propane D) Butane

14. Dryness fraction of steam in a container is 0.5. Enthalpy of saturated water corresponding to temperature in the container is 1344KJ/Kg and enthalpy of saturated steam is 2749 KJ/Kg. Enthalpy of steam in the container is:

A) 1000 KJ/kg B) 2046.5 KJ/Kg C) 3000 KJ/kg D) 4026 KJ/Kg

15. Which one is used as moderator in a typical nuclear reactor:

A) CO_2 B) H_2SO_4 C) N_2 D) Stearic acid

16. Which one is water-tube boiler

A) Cochran B) Lancashire C) Cornish D) Bacock and Wilcox

17. Economiser is a type of

A) Heat exchanger that exchanges some parts of the waste heat of the flue gas to the feed water.
B) Heat exchanger that exchanges some parts of the waste heat of the flue gas to the generator.
C) Heat exchanger that exchanges some parts of the waste heat of the flue gas to the air-conditioning unit of the power plant.
D) Heat exchanger that exchanges some parts of the heat of the Boiler to the Turbine.

18. Ideal Brayton cycle consists of:

A) Isentropic compression, Isentropic expansion, Isobaric heat addition and Isobaric heat rejection
B) Isentropic compression, Isentropic expansion, Isochoric heat addition and Isochoric heat rejection
C) Isentropic compression, Isentropic expansion, Isothermal heat addition and Isothermal heat rejection
D) Isobaric compression, Isochoric expansion, Isobaric heat addition and Isobaric heat rejection

19. Otto cycle efficiency formula is a function of:

A) Mean effective pressure B) Peak temperature
C) Temperature of heat rejection D) Compression ratio

20. Heat addition in an ideal Diesel cycle occurs at:

A) Constant volume B) Constant temperature
C) Constant pressure D) Constant entropy

21. The inner surface of a plane brick wall is at 60^0C and the outer surface is at 20^0C. Calculate the rate of heat transfer per m^2 of surface area of the wall, which is 260 mm thick. The thermal conductivity of the brick is 0.55 W/m K.

A) 75 W/m^2 B) 84.6 W/m^2 C) 120 W/m^2 D) 1200 W/m^2

22. Consider a case of convective heat transfer. Temperature difference between the surface and the fluid gets doubled. Heat transfer will

A) Increase by a factor of 4
B) Double
C) Increase by a factor 16
D) Increase by square of velocity of fluid

23. Rate of radiation heat transfer per unit area from a black surface is directly proportional to

A) Fourth power of the absolute temperature of the surface
B) Square of the absolute temperature of the surface
C) Absolute temperature of the surface
D) Sixth power of the absolute temperature of the surface

24. A refrigerator absorbs 600 Joules from a space to be cooled while consuming 200 Joules of work. CoP is

A) 3 B) 1/3 C) 3/2 D) 2/3

25. In a fluid flow, shear force is directly proportional to

A) Temperature gradient in the fluid B) Instantaneous velocity
C) Velocity gradient in the fluid D) Square of the velocity

26. Height of a triangle is 9 metres. Distance of centroid of the triangle from the base will be

A) 3 metres B) 4.5 metres C) 6 metres D) 9/4 metres

27. Moment of inertia of a 4 m^2 area about a given axis is 16 m^4. Radius of gyration will be

A) 4 m B) 12 m C) 2 m D) 8 m

28. A cantilevered square plate of thickness 3 mm and side 10 cm, made of mild steel, is experiencing transient vibrations. Damping ratio in vibrations will be around

A) 0.5 B) 0.8 C) 0.004 D) 2

29. Damping force applied by a dash-pot is directly proportional to

A) Acceleration B) Displacement C) Velocity D) Jerk

30. A spring expands by 10 cm upon application of 1 N. It's stiffness is

A) 0.1 N/cm B) 1 N/cm C) 10 N/cm D) 100 N/cm

31. Consider a bar of constant cross-sectional area A and of length L. How much will be deflection of the free end, caused by the application of a concentrated force P? The elastic modulus of the material is E.

A) PA/(EL) B) P/AE C) EA/PL D) PL/(AE)

32. Determine the deflection of free end of elastic bar of length 'L' and area of cross-section 'A', caused by its own weight 'W'. The elastic modulus of the material is E.

A) WL/(2AE) B) WL/AE C) WE/AL D) WL^2/AE

33. An elastic body is under state of uni-axial stress. The strain energy stored per unit volume of the material will be:

A) Stress * Strain/2 B) Stress * Strain
C) Stress * Strain^2 D) Stress / Strain

34. A bar is of uniform cross-sectional area A and the normal axial stress Ω is constant throughout. L is length of the bar. The elastic modulus of the material is E. Total strain energy stored is:

A) $\Omega^2AL/(2E)$ B) $\Omega AL/(2E)$ C) Ω^2AL/E D) $\Omega^2A/(2E)$

35. Consider a bar of constant cross-sectional area A and of length L. The axial bar is held at both ends. If the bar temperature increases by T, what axial force develops in the bar? The elastic modulus of the material is E. α is coefficient of thermal expansion.

A) αTA B) αTAE C) αTAEL D) αT

36. A 50 mm cube of steel is subjected to a uniform pressure of 200 MPa acting on all faces. Determine change in dimension between two parallel faces of the cube. Take E = 200 GPa and Poisson's ratio as 0.25.

A) 0.025 mm B) 1 mm C) 0.5 mm D) 2 mm

37. Which one is correct? G is shear modulus, E is elastic modulus, μ is Poisson's ratio.

A) $E=G(1+\mu)$ B) $E=2G(1+\mu/2)$ C) $E=2G(1+\mu)$ D) $E=2G(2+\mu)$

38. Which one is lower pair?

A) Nut turning on a screw B) Wheel rolling on a surface
C) Cam and follower pair D) Tooth gears

39. In a Deltoid linkage,

A) All links are of unequal length
B) The equal links are opposite to each other
C) The equal links are adjacent to each other
D) Two links are fixed

40. In a linkage, input torque is 100 Nm and output torque is 1000 Nm. Weight of input link is 12kg greater than the output link. Mechanical advantage is:

A) 12 B) 1.2 C) 10 D) 120

41. Which one is inversion of double slider-crank chain?

A) Hand pump B) Elliptical trammel
C) Crank and slotted-lever mechanism D) Whitworth quick return mechanism

42. If the sleeve of a Watt governor is loaded with a heavy mass, it becomes

A) Proell governor B) Hartnell governor
C) Porter governor D) Hartung governor

43. Maximum speed of a governor corresponding to no-load conditions is 1500 rpm. Minimum speed corresponding to full-load conditions is 500 rpm. Sensitiveness is

A) 1 B) 2 C) 3 D) 4

44. The stagnation temperature of the flowing fluid is the temperature attained when the fluid

A) Is Isentropically decelerated to zero velocity
B) Was at initial condition

C) Is abruptly made to take U turn
D) Is brought to rest while extracting work from it

45. Rake angle in cutting tools is generally of the order of
A) -45^0 B) 15^0 C) 45^0 D) 90^0

46. Carbon tool steels used as cutting tools have carbon percentages between
A) 8 to 10 % B) 3 to 5% C) 2 to 10 % D) 0.6 to 1.5 %

47. Which one is not used commonly as an abrasive material in grinding process
A) Ferrous sulphate B) Aluminium oxide
C) Cubic Boron Nitride D) Diamond

48. A two degree of freedom spring mass damper system will have
A) Only one natural frequency
B) Have two natural frequencies
C) Infinite natural frequencies
D) No natural frequency if damping ratio is less than unity.

49. In order to increase damping in the output response of a system controlled by PID control, operator will have to
A) Increase integral gain B) Increase Proportional gain
C) Reduce derivative gain D) Increase derivative gain

50. Labview software can be used
A) To do finite element analysis B) Computation Fluid dynamics
C) Data acquisition D) Solid modelling

x-x-x