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ROLL No.

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TEST BOOKLET No.

066

TEST FOR POST GRADUATE PROGRAMMES

CHEMICAL ENGINEERING

Time: 2 Hours

Maximum Marks: 450

INSTRUCTIONS TO CANDIDATES

1. You are provided with a Test Booklet and an Optical Mark Reader (OMR) Answer Sheet to mark your responses. Do not soil the Answer Sheet. Read carefully all the instructions given on the Answer Sheet.
 2. Write your Roll Number in the space provided on the top of **this page**.
 3. Also write your Roll Number, Test Code, and Test Subject in the columns provided for the same on the **Answer Sheet**. Darken the appropriate bubbles with a **Ball Point Pen**.
 4. The paper consists of 150 objective type questions. All questions carry equal marks.
 5. Each question has four alternative responses marked **A, B, C** and **D** and you have to **darken** the bubble fully by a **Ball Point Pen** corresponding to the correct response as indicated in the example shown on the Answer Sheet.
 6. Each correct answer carries 3 marks and each wrong answer carries 1 minus mark.
 7. Please do your rough work only on the space provided for it at the end of this Test Booklet.
 8. You should return the Answer Sheet to the Invigilator before you leave the examination hall. However, you can retain the Test Booklet.
 9. Every precaution has been taken to avoid errors in the Test Booklet. In the event of such unforeseen happenings the same may be brought to the notice of the Observer/Chief Superintendent in writing. Suitable remedial measures will be taken at the time of evaluation, if necessary.
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SEAL



CHEMICAL ENGINEERING

1. The number of boiling points of a pure substance could be
 - (A) limited
 - (B) only one
 - (C) infinity
 - (D) depends on the state of substance

2. One liquid stream containing 10 wt % salt is mixed with another liquid stream containing no salt. The resultant mixed stream contains 2 wt % salt. The ratio of flow rates of the two streams is
 - (A) 1/4
 - (B) 1/5
 - (C) 1/8
 - (D) 1/2

3. A solid material has a solid density of 1500 Kg/m^3 and bulk density of 1125 Kg/m^3 . When the material forms a packed bed, its porosity will be
 - (A) 0.25
 - (B) 1.33
 - (C) 0.33
 - (D) 0.75

4. How many kilogram of ethyl alcohol may contain 24 Kg carbon?
 - (A) 24
 - (B) 32
 - (C) 38
 - (D) 46

5. 16 gm of sulfur dioxide upon oxidation gives 18 gm of sulfur trioxide. The percentage yield of sulfur trioxide is
 - (A) 60
 - (B) 75
 - (C) 80
 - (D) 90

6. When 92 gm ethanol is completely burnt, gm of carbon dioxide will be formed
 - (A) 176
 - (B) 132
 - (C) 88
 - (D) 144

7. The normality of one weight percent aqueous sulfuric acid is nearly
 - (A) 0.02
 - (B) 0.20
 - (C) 0.10
 - (D) 0.01

8. At mean sea level and 373 K, pure water exerts a vapor pressure of about KPa
- (A) 1013 (B) 1.013
(C) 101.3 (D) 10.13
9. The specific gravities of sugar solutions are measured using scale
- (A) ° Baume (B) ° Twaddell
(C) ° Brix (D) ° API
10. The density of mercury is
- (A) 13.6 gm/L (B) 13.6 Kg/L
(C) 1360 Kg/L (D) 1360 Kg/m³
11. 5.6 liters of oxygen at NTP is equivalent to mole
- (A) 0.250 (B) 0.125
(C) 0.50 (D) 1.00
12. One lb-mole of an ideal gas at 273 K and 29.92 inches of Hg occupies a volume of
- (A) 35.91 ft³ (B) 22.4 lit
(C) 22.4 m³ (D) 359.05 ft³
13. Hydrogen molecules are held together in hydrogen molecule by bond
- (A) covalent (B) coordinate
(C) ionic (D) hydrogen
14. The nitrogen content of air is approximately
- (A) 77 mole% (B) 77 vol %
(C) 77 wt % (D) 79 wt %
15. The volume of oxygen required for complete combustion of four liters of carbon monoxide at STP is
- (A) 8L (B) 4L
(C) 2L (D) 1L



16. 16 Kg. of oxygen and 16 Kg of hydrogen are mixed together. Which species exerts a greater partial pressure in the resultant mixture?
- (A) Oxygen
(B) Hydrogen
(C) Both have the same partial pressure.
(D) It depends on the temperature
17. Pure carbon is completely burnt in oxygen. The flue gas analysis is 70% carbon dioxide, 20% carbon monoxide and 10% oxygen. The percentage of excess oxygen used is
- (A) 20
(B) 12.5
(C) 10
(D) 0
18. The composition of a gas mixture is 10% hydrogen, 10% oxygen, 30% carbon dioxide and the rest is water vapor on mole basis. If 50% of water vapor is condensed, the final mole % of hydrogen in the gas mixture on dry basis will be percent
- (A) 20
(B) 5
(C) 10
(D) 13.33
19. The fraction of total pressure exerted by methane in a mixture containing equal masses of oxygen and methane is
- (A) $\frac{3}{4}$
(B) $\frac{2}{3}$
(C) $\frac{1}{3}$
(D) $\frac{1}{2}$
20. The viscosity of air at 1 atm and 32°F is
- (A) 0.0172 poise
(B) 0.0172 cp.
(C) 1.72 poise
(D) 1.72 pa.s
21. A solution of specific gravity 1.0 contains 35 w % A and 65 w % B. If the specific gravity of A is 0.70, the specific gravity of B is.
- (A) 1.25
(B) 1.30
(C) 1.35
(D) 1.20



22. One KJ of heat is supplied to liquid water and its temperature rises by 2 K. What is the quantity of water heated?
- (A) 4.186 Kg
(B) 4.186 gm
(C) 119.4 gm
(D) None of the above
23. Lurgi gasifier is a
- (A) fixed bed
(B) moving bed
(C) fluidized bed
(D) entrained bed
24. Aryl benzene sulfonate is a
- (A) synthetic rubber
(B) plasticizer
(C) detergent
(D) solvent
25. are the more preferred catalysts in fluidized bed catalytic reactors.
- (A) Platinum based
(B) low alumina
(C) Zeolites
(D) high alumina
26. Removal of dissolved gases from gasoline is called
- (A) stripping
(B) desorption
(C) degassing
(D) stabilization
27. Powdered coal is gasified in process.
- (A) Lurgi
(B) Shell
(C) Winkler
(D) Koppers-Totzek
28. Flexible foam is usually made of
- (A) polyurethanes
(B) silicones
(C) polyesters
(D) polyamides
29. The importance of methanation step in synthesis gas production for ammonia manufacture is for
- (A) removing carbon monoxide
(B) removing carbon dioxide
(C) making more hydrogen
(D) removing both CO and CO₂ from synthesis gas.



30. Junker's calorimeter is used to find the calorific value of
- (A) Fuel oil (B) Gasoline
(C) Coal (D) Gaseous fuel
31. Liquefied petroleum gas is a mixture of
- (A) ethane and propane (B) butane and propane
(C) pentane and butane (D) ethane and Butane
32. Shift conversion reaction is used to produce
- (A) methane (B) hydrogen
(C) carbon monoxide (D) ammonia
33. The solvent used for dewaxing in a petroleum refinery is
- (A) DEA (B) CS₂
(C) furfural (D) propane
34. Most of the hydrocracking processes in a petroleum refinery are carried out in bed reactors
- (A) fixed (B) fluidized
(C) moving (D) entrained.
35. Smoke point improvement of kerosine is achieved by the removal of
- (A) moisture (B) aromatics
(C) aliphatics (D) sulfur
36. Which arrangement of distillation towers in a petroleum refinery provides excellent service?
- (A) Top tray reflux (B) Pump-back reflux
(C) Pump-around reflux (D) Total reflux
37. The solvent which can be used for the removal of CO₂ and H₂S is
- (A) carbon disulfide (B) pentane
(C) ethylene glycol (D) hot potassium carbonate



38. A gas can always be condensed by
- (A) cooling alone
 - (B) compressing alone
 - (C) cooling below its triple point
 - (D) cooling below its critical temperature and then compressing
39. Leather undergoes tanning for
- (A) stiffening
 - (B) smoothening
 - (C) making it water-resistant
 - (D) making it flexible
40. The catalyst used in commercial process for manufacture of nitric acid is
- (A) zeolite
 - (B) platinum - nickel
 - (C) platinum - rhodium
 - (D) vanadium - chromium
41. The pumps used for pumping boiler-feed water are
- (A) reciprocating
 - (B) gear
 - (C) turbine
 - (D) multistage centrifugal
42. When a shear stress is applied to a substance it is found to resist it by static deformation. The substance is a
- (A) liquid
 - (B) non Newtonian
 - (C) solid
 - (D) power law fluid.
43. The predominant fluid property associated with cavitation phenomenon in centrifugal pumps is
- (A) density
 - (B) surface tension
 - (C) viscosity
 - (D) vapor pressure
44. The linear momentum equation is based on
- (A) Bernoulli's equation
 - (B) Newton's first law
 - (C) Newton's second law
 - (D) None of the above



45. For standard steel pipes, for a given NPS, as Schedule number increases, wall thickness
- (A) decreases
 - (B) increases
 - (C) remains same
 - (D) schedule number has nothing to do with wall thickness.
46. When a material is subjected to a constant shear rate a rapid increase in its apparent viscosity occurs; such a phenomenon is observed in
- (A) rheopectics
 - (B) dilatants
 - (C) viscoelastics
 - (D) thixotropics
47. A perfect fluid is
- (A) compressible and gas
 - (B) a real fluid
 - (C) the one which obeys ideal gas law
 - (D) incompressible and frictionless
48. When small particles are settling in a fluid at very low Reynolds numbers, it may be described as flow
- (A) creeping
 - (B) rotational
 - (C) stream line
 - (D) irrotational
49. In fluid flow at low Reynolds numbers, forces are important
- (A) Inertial
 - (B) Viscous
 - (C) Buoyancy
 - (D) Gravitational
50. The capacity and effectiveness of industrial screens are
- (A) proportionally related
 - (B) independent of each other
 - (C) inversely related
 - (D) have a fixed relationship.
51. Ball mills and tube mills are differentiated based on the
- (A) length to diameter ratio
 - (B) final product size
 - (C) operating speed
 - (D) type and size of grinding media



52. The compressibility coefficient of a compressible filter cake is
- (A) 0
(B) 0.2 – 0.8
(C) 1
(D) above unity
53. In Tyler Standard Screen series the ratio of actual mesh dimension of any screen to that of next smaller screen is
- (A) 1.732
(B) 1.189
(C) 1.414
(D) 0.707
54. A filter aid helps to
- (A) increase filtration rate
(B) increase cake porosity
(C) protect the filter medium
(D) None of the above
55. Equivalent diameter of a solid particle is the diameter of a sphere having the same as the particle
- (A) surface area
(B) weight
(C) volume
(D) density
56. Kynch theory is used in the design of
- (A) filters
(B) centrifuges
(C) classifiers
(D) clarifiers
57. Pug mills are used for
- (A) dry fine grinding
(B) coarse crushing
(C) preparation of pastes
(D) None of the above
58. The velocity distribution for laminar flow between two parallel plates
- (A) is constant over the whole cross section for flow.
(B) varies linearly across the cross-section for flow.
(C) varies parabolically across the cross-section with a maximum at the centre.
(D) varies nonlinearly across the cross section with a minimum at the centre



59. Which one of the following gases can emit as well as absorb radiation appreciably at high temperatures?
- (A) oxygen (B) hydrogen
(C) nitrogen (D) carbon dioxide.
60. In a shell and tube condenser, the pressure drop on condensing - vapor side typically should not be more than
- (A) 70 KPa (B) 15 KPa
(C) 1 atm (D) 2 psi
61. Leidenfrost point occurs in
- (A) nucleate boiling (B) transition boiling
(C) film boiling (D) natural convection
62. When steam is to be used as a heat-transfer medium it is desirable that it is
- (A) wet saturated (B) superheated
(C) dry saturated (D) partially saturated.
63. Which one of the following has the lowest Prandtl number?
- (A) liquid metals (B) gases
(C) organic liquids (D) inorganic liquids
64. The presence of multi-molecular gases and water vapor in burner gases of pipe still heaters will improve heat transfer by
- (A) conduction (B) convection
(C) radiation (D) heat transfer is not influenced.
65. The thermal equilibrium relation in a heat exchanger, when plotted as a graph, will have a slope of
- (A) > 1 (B) < 1
(C) $+ 1$ (D) -1
66. Heat exchangers which are especially useful with food products and similar heat-sensitive materials are heat exchangers.
- (A) double - pipe (B) spiral - plate
(C) plate - type (D) None of the above



67. Temperature 'pinch' and 'cross' can occur in heat exchanger
- (A) shell & tube single pass (B) double pipe
(C) plate-type (D) None of the above
68. A preferred heat exchanger for gas-gas service is exchanger.
- (A) double pipe (B) spiral plate
(C) finned tube (D) plate type
69. At temperature equilibrium the ratio of total radiating power of any body to its absorptivity depends only upon the temperature of the body. This statement is called
- (A) Plank's law (B) Kirchoff's law
(C) Stefan-boltzman law (D) None of the above
70. In which case the overall heat transfer coefficient will be the highest when heat transfer occurs without direct contact of streams?
- (A) gas to liquid (B) during phase change
(C) liquid to liquid (D) during boiling.
71. The molecular diffusivity D_{AB} for component A diffusing in component B and the diffusivity D_{BA} for B diffusing in A are equal for a mixture of
- (A) real gases (B) any fluids
(C) ideal gases (D) both ideal and real gases.
72. Peclet number is used to characterize.
- (A) mass transfer (B) diffusion
(C) mass dispersion (D) None of the above
73. In gas-liquid dispersion operations the gas bubble size depends upon
- (A) liquid viscosity (B) gas density
(C) interfacial tension (D) All of the above
74. The dimensionless group used in calculations related to liquid-liquid dispersions is number
- (A) Peclet (B) Weber
(C) Euler (D) Fraude



75. One of the following set of conditions may be used to enhance the rate of a gas absorption process.

Where T is temperature and P is pressure.

- (A) low T and P (B) high T and P
(C) low T and high P (D) high T and Low P
76. Structured packings are preferred in packed towers for mass transfer compared to conventional dumped packings because they provide
- (A) less pressure drop though the contact between phases is poor.
(B) better mass transfer with high pressure drop.
(C) better mass transfer with low pressure drop
(D) none of the reasons given in a, b, c.
77. In the design of gas absorption equipment like packed and tray towers, the ratio of actual liquid rate to minimum liquid rate should preferably be in the range of
- (A) 1 - 2 (B) 1.5 - 2.5
(C) 0.5 - 1.5 (D) 1.1 - 1.5
78. Higbie's penetration theory on mass transfer predicts that the transfer coefficient is directly proportional to molecular diffusivity (D) as
- (A) $D^{0.5}$ (B) D
(C) $D^{1.5}$ (D) D^2
79. In the design of sieve tray tower 'entrainment flooding considerations' are used to calculate
- (A) tray spacing (B) tray diameter
(C) number of trays (D) tower height
80. The dimensionless group in mass transfer which is analogous to Prandtl in heat transfer is
- (A) Sherwood (B) Stanton
(C) Peclet (D) Schmidt.



81. Knudsen diffusion occurs when the ratio of pore diameter to mean free path of molecules is
- (A) greater than 2.0
(B) less than 2.0
(C) less than 0.20
(D) greater than 0.20
82. The binary diffusivity of a gaseous component
- (A) is independent of pressure, but varies with temperature
(B) inversely varies with pressure.
(C) inversely varies with temperature
(D) directly varies with pressure
83. Schmidt number for gases range from about
- (A) 0.05 to 0.50
(B) 0.50 to 2
(C) 2 to 10
(D) 10 to 100
84. In agitation and mixing of liquids under laminar flow conditions, the power delivered to the liquid depends on liquid
- (A) density
(B) surface tension
(C) viscosity
(D) All of the above
85. In a liquid-liquid extraction operation reflux is to be provided at
- (A) middle
(B) extract end
(C) raffinate end
(D) any where
86. When the feed to a distillation column is at its bubble point, the q-factor is
- (A) 0
(B) 1
(C) > 1
(D) < 1
87. Spray dryer is used to make
- (A) salts
(B) sugar
(C) milk powder
(D) perfumes.



88. In a two-stage cross-current adsorption operation, for total minimum solids dosage to be used, equal dosage of solids in both stages can be used when the equilibrium relation is
- (A) linear (B) semi-logarithmic
(C) exponential (D) logarithmic.
89. Falling – film evaporators are primarily used to concentrate solutions.
- (A) salt (B) sugar
(C) alkali (D) highly heat-sensitive.
90. When a slow reaction occurs between gas and liquid phases, a preferred contactor is a
- (A) spray tower (B) packed tower
(C) bubble column (D) tray tower
91. When a small quantity of water evaporates into a large quantity of unsaturated air, the steady-state temperature attained is referred to as temperature.
- (A) wet bulb (B) dry bulb
(C) bubble point (D) dew point.
92. When a tray tower is operated at high vapor and liquid rates, one of the following may occur.
- (A) entrainment flooding (B) weeping
(C) downcomer flooding (D) dumping.
93. An increase in absolute humidity leads to decrease in RH only when
- (A) temperature decreases (B) temperature increases
(C) pressure increases (D) pressure decreases
94. The problem of 'hot spots' may occur in reactors
- (A) fluidized bed (B) trickle bed
(C) packed bed (D) moving bed



95. For a porous catalyst particle, when Thiele modulus is very small, the effectiveness factor becomes
- (A) infinity (B) very large
(C) zero (D) close to unity
96. When complete back-mixing prevails in a flow vessel, the Peclet number must be
- (A) unity (B) zero
(C) infinity (D) less than unity, but not zero
97. When the data of specific reaction rates at various temperatures is given for a chemical reaction, it would be possible to find its
- (A) feasibility (B) enthalpy
(C) order (D) activation energy
98. Liquid-liquid heterogeneous reactions may be carried out in
- (A) tubular flow reactors
(B) packed towers
(C) spray column
(D) counter current staged contactors
99. A back-mix reactor always remains thermally stable when reaction is carried out.
- (A) multiple (B) exothermic reversible
(C) endothermic irreversible (D) auto-catalytic
100. The equilibrium constant for the reaction $A+B = C+D$ is 0.25 at a given temperature. If the initial reaction mixture contains one mole each of A and B only, the equilibrium conversion is
- (A) 1 (B) $\frac{1}{3}$
(C) 2 (D) $\frac{2}{3}$



101. Total pressure method is useful in the evaluation of kinetics of reactions.
- (A) liquid-phase (B) photochemical
(C) biochemical (D) None of the above
102. A reaction in which rate-concentration curve follows a parabola is reaction
- (A) photochemical (B) biochemical
(C) series (D) None of the above
103. For series reactions where intermediate product is desirable, the most suitable reactor is
- (A) batch reactor (B) BMR
(C) PFR (D) PFR with recycle
104. In a porous catalyst particle, the reactant concentration rapidly falls to zero a little distance away from pore mouth, when the Thiele modulus is
- (A) 0.10 (B) 5
(C) 0.50 (D) 10
105. The half-life of a first-order reaction is
- (A) independent of initial concentration of reactant (C_{A0})
(B) varies exponentially with C_{A0}
(C) varies linearly with C_{A0}
(D) the statements given in a, b and c are not correct
106. The I-curve and E-curve are identical for a flow vessel in which prevails.
- (A) plug flow (B) laminar flow
(C) complete back mixing (D) macro-mixing
107. When the order of a reaction is greater than unity, the half-life of the reaction as the initial concentration of the reactant increases.
- (A) increases (B) increases and decreases
(C) remains same (D) decreases



108. A PFR has a volume of one cubic meter and is fed with a reaction mixture at a rate of 600 liters per minute. The space velocity is
- (A) 0.60 min. (B) 600 min⁻¹
(C) 0.01 sec⁻¹ (D) 0.01 sec.
109. A single fixed temperature scale is based on
- (A) ice point (B) critical point
(C) triple point of water (D) steam point
110. An adiabatic system can exchange energy with its surroundings
- (A) in the form of heat only
(B) in the form of work only
(C) both in the form of heat & work
(D) either in the form of heat or work
111. The relation between boiling point of a solution and that of pure water at the same pressure is
- (A) exponential (B) cubic
(C) linear (D) quadratic
112. Super cooled liquid water is in a state of equilibrium
- (A) stable (B) unstable
(C) neutral (D) metastable
113. When moist air is heated at constant pressure,
- (A) absolute humidity changes (B) RH increases
(C) RH decreases (D) RH does not change.
114. When wet steam is throttled to a low pressure, its temperature
- (A) increases (B) decreases
(C) does not change (D) None of the above
115. The chemical potential of a pure substance is equal to
- (A) molar Gibbs' free energy (B) specific Gibbs' free energy
(C) Gibbs' free energy (D) molar enthalpy



116. In an insulated burner, the flame temperature reaches maximum when the fuel is burnt with
- (A) theoretical air (B) stoichiometric oxygen
(C) 10% excess air (D) 50% excess air
117. No gas can assume a value for C_p/C_v greater than
- (A) 1.0 (B) 1.4
(C) $\frac{3}{5}$ (D) $\frac{5}{3}$
118. For an ideal gas the change in Gibbs' free energy at constant temperature is
- (A) $RT (dP/P)$ (B) $RT d(\ln P)$
(C) $RT (\ln T)$ (D) $RT (\ln V)$
119. The difference between the actual property value of a solution and the value it would have as an ideal solution at the same pressure, temperature and composition is called property.
- (A) residual (B) partial molal
(C) excess (D) specific solution
120. Gibbs – Duhem equation tells how the partial molar properties change with.
- (A) all P, T and C (B) C at constant P & T
(C) T at constant P & C (D) P at constant T & C
where P, T, C are pressure, temperature, composition respectively.
121. The mean kinetic energy of a molecule depends on
- (A) temperature and mass (B) pressure and mass
(C) mass only (D) temperature only
122. The definition of acentric factor introduced by Pitzer and coworkers makes its value for argon, krypton and xenon
- (A) Zero (B) unity
(C) < 1 (D) > 1



123. A Carnot refrigerator is considered because
- (A) any refrigerant can be used
 - (B) it is easy to construct and operate
 - (C) it would be compact and light weight
 - (D) it is taken as a standard of perfection against which the performance of all others are compared
124. Reactions which are temperature-sensitive are the
- (A) reactions with low activation energies
 - (B) reactions with high activation energies
 - (C) irreversible reactions
 - (D) reversible reactions
125. The temperature dependency of latent heat of vaporization of a liquid is given by equation
- (A) Kirchoff
 - (B) Claussius-Clapeyron
 - (C) Classius
 - (D) Gibbs-Duhem.
126. Upgrading of low-octane gasolines can be achieved by
- (A) catalytic reforming
 - (B) catalytic cracking
 - (C) alkylation
 - (D) mixing additives
127. Teeter beds are essentially
- (A) packed bed reactors
 - (B) fluidized bed dryers
 - (C) fluidized beds for adsorption
 - (D) packed beds for adsorption.
128. The thermal boundary layer and momentum boundary layer are of same thickness when Prandtl number is
- (A) very small
 - (B) very large
 - (C) equal to 0.50
 - (D) unity



129. The Indian Standard Code IS-4503 is used for the design of
- (A) unfired pressure vessels
 - (B) distillation columns
 - (C) shell and tube heat exchangers
 - (D) storage tanks.
130. Which one of the following heads is the weakest for a given pressure vessel?
- (A) Flat
 - (B) Hemispherical
 - (C) Ellipsoidal
 - (D) Torispherical
131. A vertical condenser is designed for condensing hydrocarbon vapors. If it is installed horizontally, will its capacity be affected?
- (A) Yes, it decreases
 - (B) No, it does not
 - (C) Yes, it increases
 - (D) it depends on the vapor
132. Preheating of a gaseous fuel increases
- (A) ignition temperature
 - (B) flame temperature
 - (C) rate of combustion
 - (D) flame length
133. In typical cracking operations in petroleum refining the role of steam is to
- (A) enhance cracking
 - (B) maintain desired temperature
 - (C) reduce hydrocarbon partial pressure
 - (D) maintain catalyst activity
134. Stalagmometer is used for the measurement of
- (A) viscosity
 - (B) density
 - (C) refractive index
 - (D) surface tension
135. The amplitude ratio for the sinusoidal response of a transportation lag is always
- (A) less than unity
 - (B) zero
 - (C) unity
 - (D) greater than unity



143. An MFR operating under steady-state conditions can be modeled as system
- (A) lumped
 - (B) distributed
 - (C) neither lumped nor distributed
 - (D) both lumped and distributed
144. is a measure of catalytic activity
- (A) particle size
 - (B) pore size
 - (C) surface area
 - (D) pore volume
145. Head losses through valves and fittings are commonly modeled as proportional to
- (A) static head
 - (B) pressure drop
 - (C) total head
 - (D) velocity head
146. Fault tree analysis is a risk assessment method
- (A) semi-qualitative
 - (B) qualitative
 - (C) quantitative
 - (D) semi-quantitative
147. Shooting method is used to solve
- (A) initial value problems
 - (B) boundary value problems
 - (C) numerical integration problems
 - (D) None of the above
148. For solving partial differential equations numerically method is used
- (A) Galerkin
 - (B) Range-Kutta
 - (C) Milne
 - (D) Crank-Nicholson



149. When detonation takes place, the flame front travels at
- (A) less than sonic velocity
 - (B) greater than sonic velocity
 - (C) sonic velocity
 - (D) light velocity
150. Of the pressure vessels having different shell diameters, but same shell thickness, which one of the following withstands higher pressure?
- (A) short vessel having large diameter
 - (B) larger diameter vessel
 - (C) tall vessel having large diameter
 - (D) smaller diameter vessel
