

M.Tech
6

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2011.
M.Tech. (ENVIRONMENTAL ENGINEERING MANAGEMENT)
COURSE CODE : 393

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 393

Time : 2 Hours

Max : 400 Marks

Instructions to Candidates :

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. If in a triangle ABC , $\cos A/a = \cos B/b = \cos C/c$, then the triangle is
 (A) Right angled (B) Obtuse angles
 (C) Equilateral (D) Isosceles
2. The angle of elevation of the top of an incomplete vertical pillar at a horizontal distance of 100 mt from its base is 45° . If the angle of elevation of the top of the complete pillar at the same point is to be 60° , then the height of the incomplete pillar is to be increased by,
 (A) $50\sqrt{2}$ mt. (B) 100 mt
 (C) $100(\sqrt{3} - 1)$ mt (D) $100(\sqrt{3} + 1)$ mt
3. If $3 + (a + ib) = 5 + 8i$, then
 (A) $a = 5$ (B) $b = 8$
 (C) $a = 2, b = 8$ (D) $a = 8, b = 2$
4. The point $(1,1)$, $(-1,-1)$ and $(-\sqrt{3}, \sqrt{3})$ are the angular points of a triangle, then the triangle is
 (A) Right angled (B) Isosceles
 (C) Equilateral (D) None of these
5. P and Q are the points on the line joining $A(-2, 5)$ and $B(3,1)$ such that $AP = PQ = QB$. Then the mid-point of PQ is
 (A) $(1/2, 3)$ (B) $(-1/2, 4)$ (C) $(2,3)$ (D) $(-1,4)$
6. The distance between the parallel lines $y = 2x + 4$ and $6x = 3y + 5$ is
 (A) $17/\sqrt{3}$ (B) 1
 (C) $3/\sqrt{5}$ (D) $17\sqrt{5}/15$
7. A square inscribed in the circle $x^2 + y^2 - 2x + 4y + 3 = 0$. Its sides are parallel to the coordinate axes. Then one vertex of the square is
 (A) $(1 + \sqrt{2}, -2)$ (B) $(1 - \sqrt{2}, -2)$
 (C) $(1, -2 + \sqrt{2})$ (D) None of these
8. If $\lim_{x \rightarrow a} \frac{a^x - x^a}{x^x - a^a} = -1$, then a is equal to
 (A) 1 (B) 0 (C) e (D) None of these

1. If in a triangle ABC , $\cos A/a = \cos B/b = \cos C/c$, then the triangle is
 (A) Right angled (B) Obtuse angles
 (C) Equilateral (D) Isosceles
2. The angle of elevation of the top of an incomplete vertical pillar at a horizontal distance of 100 mt from its base is 45° . If the angle of elevation of the top of the complete pillar at the same point is to be 60° , then the height of the incomplete pillar is to be increased by,
 (A) $50\sqrt{2}$ mt. (B) 100 mt
 (C) $100(\sqrt{3} - 1)$ mt (D) $100(\sqrt{3} + 1)$ mt
3. If $3 + (a + ib) = 5 + 8i$, then
 (A) $a = 5$ (B) $b = 8$
 (C) $a = 2, b = 8$ (D) $a = 8, b = 2$
4. The point $(1,1)$, $(-1,-1)$ and $(-\sqrt{3}, \sqrt{3})$ are the angular points of a triangle, then the triangle is
 (A) Right angled (B) Isosceles
 (C) Equilateral (D) None of these
5. P and Q are the points on the line joining $A(-2, 5)$ and $B(3,1)$ such that $AP = PQ = QB$. Then the mid-point of PQ is
 (A) $(1/2, 3)$ (B) $(-1/2, 4)$ (C) $(2,3)$ (D) $(-1,4)$
6. The distance between the parallel lines $y = 2x + 4$ and $6x = 3y + 5$ is
 (A) $17/\sqrt{3}$ (B) 1
 (C) $3/\sqrt{5}$ (D) $17\sqrt{5}/15$
7. A square inscribed in the circle $x^2 + y^2 - 2x + 4y + 3 = 0$. Its sides are parallel to the coordinate axes. Then one vertex of the square is
 (A) $(1 + \sqrt{2}, -2)$ (B) $(1 - \sqrt{2}, -2)$
 (C) $(1, -2 + \sqrt{2})$ (D) None of these
8. If $\lim_{x \rightarrow a} \frac{a^x - x^a}{x^x - a^a} = -1$, then a is equal to
 (A) 1 (B) 0 (C) e (D) None of these

16. For the curve $y = 2x + 3x^{2/3}$
- (A) max. at $x = -1$, min. at $x = 0$ (B) max. at $x = -1$, and neither at $x = 0$
 (C) min. at $x = -1$ (D) none of these
17. The distance s in metres described by a particle in t seconds is given by $s = ae^{t+be^{-t}}$. The acceleration of the particle at time t is
- (A) s (B) as
 (C) $-bs$ (D) None of these
18. The maximum height is reached in 3 seconds by a stone thrown up vertically and moving under the equation $s = ut - 4.9t^2$, where s is in metres and t is in seconds. Then $u =$
- (A) 58.8 m/s (B) 14.7 m/s
 (C) 29.4 m/s (D) None of these.
19. The value of $\int e^x \sin e^x$ is
- (A) $\cos e^x$ (B) $-\cos e^x$
 (C) $(\cos e^x)^{-1}$ (D) $\sin e^x$
20. Area bounded by the curve $xy^2 = a^2(a-x)$ and y -axis is
- (A) $\pi a^2/2$ (B) πa^2
 (C) $3\pi a^2$ (D) $3\pi a^2/2$
21. Solution of the diff. eq. $\sin 2x (dy/dx) - y = \tan x$ is
- (A) $y = \tan x + c \sqrt{(\tan x)}$ (B) $x-y \sin x = c$
 (C) $xy \tan x = c$ (D) None of these
22. The point with position vectors $10i + 3j$, $12i-5j$ and $ai+11j$ are collinear if the value of a is
- (A) -8 (B) 4
 (C) 8 (D) 12
23. If θ be the angle between the vectors $4(i-k)$ and $i + j + k$, then θ is
- (A) $\pi/4$ (B) $\pi/3$
 (C) $\pi/2$ (D) $\cos^{-2}(1/\sqrt{3})$

24. The set of values for which $x^3 + 1 \geq x^2 + x$ is
- (A) $x \leq 0$ (B) $x \geq 0$
 (C) $x \geq -1$ (D) $-1 \leq x \leq 1$
25. The smallest value of $x^2 - 3x + 3$ in the interval $(-3, 3/2)$ is
- (A) $3/4$ (B) 5
 (C) -15 (D) -20
26. ML^2T^{-2} represents
- (A) The moment of force (B) Acceleration
 (C) Force (D) Momentum
27. Two bodies of different masses m_a and m_b are dropped from two different heights a and b . The ratio of times taken by the two to drop through these distances is
- (A) $a : b$ (B) $m_a/m_b : b/a$
 (C) $\sqrt{a} : \sqrt{b}$ (D) $a^2 : b^2$
28. The coordinates of a moving particle at any time t are given by $x = ct^2$ and $y = bt^2$, the speed of the particle at time t is given by
- (A) $2t(c + b)$ (B) $\sqrt{c^2 + b^2}$
 (C) $2t\sqrt{c^2 + b^2}$ (D) $2t\sqrt{c^2 - b^2}$
29. The velocity of a body increases for some time, then remains constant and then decreases until it comes to rest. When velocity is plotted against time, the figure obtained is
- (A) straight line (B) circle
 (C) trapezium (D) square
30. A cyclist taking a turn heads inwards while a car passenger taking the same turn is thrown outwards. The reason is
- (A) That car is heavier than cycle
 (B) That car has four wheels, while the cycle has only two
 (C) That cyclist has to counteract the centrifugal force, while the passenger is only thrown by it
 (D) The difference in the speed of two

31. An electric fan has blades of length 30 cm as measured from the axis of rotation. If the fan is rotating at 1200 r.p.m., the acceleration of a point on the tip of the blade is about
- (A) 1600 meter per sec² (B) 4740 meter sec²
 (C) 2370 meter per sec² (D) 5055 meter per sec²
32. The minimum velocity of projection to go out from the earth's gravitational pull is called
- (A) Terminal velocity (B) Escape velocity
 (C) Angular velocity (D) Orbital velocity
33. A metallic sphere with an internal cavity weights 40 gm. wt. in air and 20 gm. wt. in water. If the density of material with cavity be 8 gm/cm³ then volume of the cavity is
- (A) Zero (B) 15 cm³
 (C) 5 cm³ (D) 20 cm³
34. Two vessels A and B have the same base area and contain water to the same height, but the mass of water in A is four times that in B. The ratio of the liquid thrust at the base of A to that at the base of B is
- (A) 4:1 (B) 2:1
 (C) 1:1 (D) 16:1
35. Viscosity is the property of liquids by virtue of which
- (A) Liquid oppose the relative motion of its parts
 (B) Liquid pushes neighbouring molecules
 (C) Liquid attracts other molecules
 (D) Liquid becomes conducting
36. In an ideal gas of density d , the pressure exerted at a temperature T is P . Then P is proportional to
- (A) d (B) $d^{-1/2}$
 (C) d^0 (D) d^2
37. Five liters of benzene weigh
- (A) More in summer than in winter (B) More in winter than in summer
 (C) Equal in winter and summer (D) None of the above

38. Two thermometers x and y have fundamental intervals of 80° and 120° . When immersed in ice, they show the readings of 20° and 30° . If y measures the temperature of body as 120° the reading of x is
- (A) 55° (B) 65°
(C) 75° (D) 80°
39. Which of the following produces more severe burns?
- (A) Boiling water (B) Steam
(C) Hot air (D) Sun rays
40. Heat required to convert 1 gm of ice at 0°C into steam at 100°C is
- (A) 100 cal (B) 716 cal
(C) 0.01 kilo-calorie (D) 1 kilo-calorie
41. It is difficult to cook at high altitude, because
- (A) there is less oxygen in the air
(B) due to fall in temperature, one has to give more heat
(C) due to decrease in atmospheric pressure, the boiling point of water decreases
(D) of high moisture content at higher altitudes
42. The factor not need to calculate heat lost or gained when there is a change of state is
- (A) Weight (B) Latent heat
(C) Nature of the substance (D) Temperature change
43. When a soluble impurity is added to a liquid, the freezing point of the liquid
- (A) remains unchanged (B) rises
(C) falls (D) may rise or fall
44. When a tube of length l and radius a is connected to a pressure head of height h , then volume of fluid flowing through the tube is 16 cm^3 . If a tube of length l and radius $\frac{a}{\sqrt{2}}$ is connected to the same pressure head, then the volume of the fluid flowing through this tube is
- (A) 16 cm^3 (B) 4 cm^3 (C) 1 cm^3 (D) 8 cm^3
45. The flow of fluid is laminar or streamline is determined by
- (A) Rate of flow of fluid (B) Density of fluid
(C) Radius of tube (D) Coefficient of viscosity of liquid

46. Water is flowing through a horizontal pipe in stream line flow. At the narrowest part of the pipe
- Velocity is maximum and pressure is minimum
 - Pressure is maximum and velocity is minimum
 - Both the pressure and velocity are maximum
 - Both the velocity and pressure are minimum
47. The terminal speed of a rain drop of radius 0.3 mm in air is 1 m/sec. If the coefficient of viscosity of air is 18×10^{-5} poise, then the viscous force on the drop is
- 101.73×10^{-4} dyne
 - 101.73×10^{-5} dyne
 - 16.59×10^{-5} dyne
 - 16.95×10^{-4} dyne
48. A ball rise to surface at a constant velocity in liquid whose density is 4 times greater than that of the material of the ball. The ratio of the force of friction acting on the rising ball and its weight is
- 3 : 1
 - 4 : 1
 - 1 : 3
 - 1 : 4
49. The kinetic theory of gases assumes that the molecules of a given gas are
- All identical
 - All different
 - Some identical with each other but different from others
 - Exactly 50% identical
50. A container A has an ideal gas at a pressure P , volume V and temperature T . A second container B has the same gas at pressure $2P$, volume $2V$ and temperature $T/2$. The ratio of the mass of gas in A and B is
- 1 : 1
 - 1 : 2
 - 1 : 4
 - 1 : 8
51. BOD level of a water sample is indicative of
- concentration of pathogens
 - concentration of organic matter
 - concentration of trace elements
 - concentration of facultative bacteria
52. The December 2004 Tsunami was caused by
- Global warming
 - Ozone hole
 - Earth quake
 - Hurricane

53. The theory of 'Survival of the fittest' was put forth by
 (A) Lamarck (B) Darwin
 (C) De vries (D) Roentgen
54. Binominal nomenclature of scientific names was introduced by
 (A) Linnaeus (B) Rastogi
 (C) Darwin (D) Lamarck
55. Global warming will not cause
 (A) Rise in sea level (B) Extinction of some species
 (C) Change in weather (D) AIDS
56. In the field of pollution control ASP stands for
 (A) Active scale prevention (B) Activated sludge process
 (C) Alternative sludge production (D) Ammonia stripping polarimetry
57. The process used to kill bacteria in the milk (to prevent spoiling of the milk) is called
 (A) fermentation (B) freezing
 (C) preservation (D) pasteurization
58. In the field of environmental analysis, AAS is the acronym for
 (A) Atomic absorption spectrometry (B) Advance atomization system
 (C) Advanced analytical spectroscopy (D) Alternative analytical solutions
59. In a relation between two individuals, the individual which receives benefit at the expense of the other individual is called
 (A) host (B) parasite
 (C) predator (D) prey
60. Of the following, which category of animals face highest possibility of extinction?
 (A) Threatened (B) Endangered
 (C) Vulnerable (D) Rare
61. Which one is a proven carcinogen?
 (A) DTB (B) TNT
 (C) DDT (D) NIT

62. Name the gas present in aerated drinks like soda water
(A) O₂ (B) H₂
(C) CO₂ (D) N₂
63. Among the following which is least damaging to environment?
(A) Nuclear power (B) Hydroelectricity
(C) Electricity from coal (D) Hydrogen energy
64. Among the following which one is not a source of biomass energy
(A) Municipal waste (B) Coal
(C) Biogas (D) Agricultural residues
65. Anaerobic bacteria are so called because
(A) They can't survive without free oxygen
(B) They can't survive with free oxygen
(C) They can't survive in cold climate
(D) They can't react with water
66. The settling velocity of a pollutant particle in a liquid medium will depend on
(A) Its chemical composition (B) Its density
(C) Its colour (D) None of the above
67. Which of the following 'pollutant' can cause eutrophication in a water body?
(A) Mercury (B) Copper
(C) Iron (D) Phosphorous
68. Which of the following is not used for disinfection of water?
(A) Chlorine (B) Potassium permanganate
(C) Sodium chloride (D) Iodine
69. The substance responsible for the 'Minimata' disaster was
(A) Copper (B) Chromium
(C) Mercury (D) Zinc
70. Which of the following is a free-floating aquatic weed?
(A) Hydrilla verticillate (B) Microcystis periphyra
(C) Salvinia molesta (D) Ipomea aquatica

71. Which of the following is a product of anaerobic digestion of biomass?
(A) HCL (B) CH₄
(C) N₂ (D) O₂
72. Ozone hole is caused by
(A) CVC (B) BBC
(C) CDC (D) CFC
73. Which one of the following gases is implicated with greenhouse effect?
(A) Chlorine (B) Fluorine
(C) CFC (D) Methane
74. Vehicular traffic introduces which of the following pollutant in the environment
(A) E. Coli (B) Ozone
(C) Lead (D) Heptachlor
75. Bhopal gas tragedy was caused by
(A) CFC (B) MIC
(C) LIC (D) PVC
76. 10 mL of N/2 HCL, 30 mL of N/10 HNO₃, 75 mL of N/5 H₂SO₄ are mixed. The normality of resulting solution is
(A) 0.4 N (B) 0.1 N
(C) 0.5 N (D) 0.2 N
77. Osmotic pressure of solution is
(A) Directly proportional to pressure
(B) Directly proportional to the concentration of solute
(C) Inversely proportional to concentration of solute
(D) Directly proportional to concentration of solvent
78. Solubility of solutes which dissolve with the liberation of heat decreases with
(A) Decrease in temperature (B) Increase in temperature
(C) No change in temperature (D) None

79. The colligative properties depend on
- Relative number of solute molecules irrespective of the nature of solute and the solvent.
 - Relative number of solute molecules in solution and nature of solvent.
 - Relative number of solute molecules and the nature of solute and solvent.
 - Relative number of solvent molecules.
80. In the coagulation of -vely charged arsenious sulphide solution, which of the following has the minimum coagulating power?
- PO_2^{3-}
 - SO_4^{2-}
 - Na^+
 - SO_3^{2-}
81. For the equilibrium $2\text{NO}_2(\text{g}) \leftrightarrow \text{N}_2\text{O}_4(\text{g}) + 14.6 \text{ k. Cals}$, increase of temperature could
- Favour the formation of N_2O_4
 - Favour the decomposition of N_2O_4
 - Not affect the equilibrium
 - Stop the reaction
82. A reversible reaction $\text{H}_2 + \text{Cl}_2 \leftrightarrow 2\text{HCl}$ is carried out in one litre flask. If the same reaction is carried out in two litre flask, the equilibrium constant will be
- Doubled
 - Decreased
 - Halved
 - Same
83. In which of the following case will the least time be required to arrive at equilibrium?
- K_c is very small
 - K_c is nearly one
 - K_c is very large
 - Difficult to predict
84. Ice \leftrightarrow water is at equilibrium. What happens if pressure is applied?
- Water changes to vapour
 - Large amount of ice forms
 - No change
 - Large amount of water forms
85. For a certain decomposition, the rate is 0.30 M sec^{-1} when the concentration of the reactant is 0.20 M . If the reaction is second order, the rate (in M sec^{-1}) when concentration is increased 3-fold is
- 0.30
 - 0.90
 - 0.60
 - 2.70

86. A 10° rise in temperature doubles the rate of reaction. This is because more molecules obtain
- (A) Activation energy (B) A catalyst
(C) A new reaction path (D) The rate-determining step
87. In the reaction $X+Y \rightarrow XY$, if the concentration of X and Y are doubled, the rate of reaction will
- (A) Increase four times (B) Increase two times
(C) Decrease two times (D) Decrease to one half
88. What is the half life of a radioactive substance if 75% of any given amount of the substance disintegrates in 60 minutes?
- (A) 2 hours (B) 30 minutes
(C) 45 minutes (D) 20 minutes
89. The value of activation energy of a chemical reaction is primarily determined by
- (A) Nature of reacting species
(B) Temperature
(C) Concentration of species
(D) Number of collisions per unit time or collision frequency
90. Unit of rate constant depends on
- (A) Order of reaction (B) Molecularity of the reaction
(C) Concentrations terms (D) Number of reactants
91. The number of atoms or molecules whose concentration alters during a chemical change is its
- (A) Molecularity (B) Order of reaction
(C) Change in reaction (D) None
92. Consider the reaction $2A + B \rightarrow C + D$. If the concentrations of the reactants are increased by three times, the rate of the reaction will increase by
- (A) 9 times (B) 81 times
(C) 64 times (D) 27 times
93. A finely divided state of catalyst is more efficient because in this state
- (A) Less active centers are formed (B) More surface area is available
(C) More energy is stored in the catalyst (D) All are correct

94. In those reactions, where enthalpy value determination is difficult by experiments, in such cases, the enthalpy value can be calculated by
- (A) Kirchoff's equation (B) Hess's law
(C) Henry's law (D) Clapeyron equation
95. An isolated system is one
- (A) That can transfer neither matter nor energy to and from its surroundings
(B) That can transfer both energy and matter
(C) That can transfer matter only
(D) That can transfer energy only
96. Entropy is a measure of disorder. For perfect crystalline substances at 0°K , it is said that entropy becomes
- (A) Minus (B) Zero
(C) Constant (D) Very low
97. On dissolving NaCl in water there is
- (A) Increase in free energy (B) Increase in entropy
(C) Decrease in entropy (D) No change in entropy
98. The pH value of 0.1 mole/litre HCL is approximately 1. The approximate pH value of 0.05 mole/litre H_2SO_4 is most likely to be
- (A) 0.05 (B) 2
(C) 0.5 (D) 1
99. The degree of dissociation of acetic acid in an aqueous solution of the acid is practically unaffected by
- (A) Adding some NaCl (B) Adding a drop of conc. HCl
(C) Diluting with water (D) Raising the temperature
100. Solubility of gases in liquids
- (A) Increase with increase in temperature
(B) Decreases with increase in temperature
(C) Decreases with decrease in temperature
(D) Unaffected by in temperature
-