Seat No._____

SUB: ENVIRONMENTAL ENGINEERING (EN)

Time: 1 Hour 30 minutes

Instructions:

1. **Ensure that all pages are printed.**
2. **Use Black ball pen only**
3. **Change in option is not allowed**
4. **There is no negative marking**
5. **Use of non -programmable scientific calculator is allowed**

1. Value of 40 JTU is approximately equal to 40 NTU when standard used is

A	Formazin	B	Silica
C	Pt-Co	D	Bentonite

2. Pure water dissociates to yield a solution having OH ion concentration of

A	10^{-5} mol/L	B	10^{-7} mol/L
C	10^{-8} mol/L	D	10^{-14} mol/L

3. For moderately hard water, hardness is in the range of

A	25-50 mg/L	B	50-75 mg/L
C	75-150 mg/L	D	150-200 mg/L

4. What is total hardness of water in mg/L as $CaCO_3$ in a sample having calcium 40 mg/L and magnesium zero mg/L

A	80	B	100
C	200	D	92.2

5. End point for Total acidity in given sample of water occurs at pH?

A	2.3	B	4.5
C	7.5	D	8.3

6. What is total alkalinity of water in mg/L as $CaCO_3$ in a sample of 50 ml having consumed titrant of 5 ml when titrated with N/40 sulfuric acid till end point?

A	100	B	125
C	200	D	250

7. How much N/1 acid should be diluted to 1000 ml to get N/50 acid

A	20 ml	B	40 ml
C	50 ml	D	100 ml

8. Solubility of atmospheric oxygen at 35^{o}C in fresh water is around?

A	4.0 mg/L	B	7.0 mg/L
C	10.0 mg/L	D	14 mg/L

9. Teeth problems are very rare when fluoride concentration is

A	Greater than 1.5 mg/l	B	Lesser than 0.5 mg/l
C	Between 1.0- 1.5 mg/l	D	Zero

10. Methemoglobinemia disease is caused in infants by

A	Chloride	B	Sulfur
C	Nitrate	D	Fluoride

11. Theoretical Oxygen Demand of a glucose solution of 900 mg/l is

A	900 mg/l	B	960 mg/l
C	1020 mg/l	D	1180 mg/l

12. When white precipitate is formed after addition of $MnSO_4$ and alkali-iodide reagent in DO test, it indicates

A	Absence of oxygen	B	Presence of excess oxygen
C	Presence of Nitrogen	D	None of these

13. 1 gram of molecular weight dissolved in 1 liter of water is called

A	Molar solution	B	Molal solution
C	Normal solution	D	None of these

14. Size of Dissolved Particles comes in the range

A	10^{-1} µm to 10^{-3} µm	B	10^{-3} µm to 10^{-5} µm
C	1 µm to 100 µm	D	10 µm to 10^{-1} µm

15. Tree system of water distribution system is also called

A	Dead end system	B	Grid Iron system
C	Radial system	D	Ring system

16. How many moles are found in 10 kg CH_4

A	160	B	525
C	625	D	1250

17. Capacity of ESR in water supply scheme design is calculated by

A	Mass curve method	B	Hardy cross method
C	Simplex method	D	None of these

18. Water boils at room temperature if pressure above it is reduced to

A	0.4 psia	B	0.6 psia
C	0.8 psia	D	None of these

19. Decomposition of radioactive element is simplest example of

A	First order reaction	B	Second order reaction
C	Zero order reaction	D	None of these

20. Minimum self-cleansing velocity to be maintained in sewer is

A	0.45 m/sec	B	1.0 m/sec
C	1.5 m/sec	D	2.0 m/sec

21. Crown corrosion in sewer is caused by oxidation of

A	CH_4	B	CUS
C	H_2S	D	None of these

22. Coliform bacteria are determined by

A	MPN test	B	Jar test
C	DO test	D	None of these

23. Shape, size and specific gravity of particles do not changes in the process of

A	Discrete settling	B	Flocculant settling
C	Zone settling	D	Compression settling

24. As per inorganic chemistry, maximum oxidation states of nitrogen can be

A	3	B	4
C	5	D	7

25. Mostly used coagulant in India is

A	Copperas	B	Alum
C	Sodium Aluminate	D	Chlorinated copperas

26. For colloidal particles, energy barrier in coagulation mechanism is removed by

A	Vaan der waal force	B	Brownian motion
C	Electrical charge	D	Water hydration

27. Settling velocity in primary settling tank depends on

A	Length of tank	B	Width of tank
C	Depth of tank	D	Length and Width of tank

28. Value of velocity gradient(G) taken for the design of blades of flocculator is

A	30-60/s	B	100-150/s
C	200-400/s	D	400-600/s

29. What value of velocity gradient shown below can be taken for design of flash mixer

A	50/s	B	100/s
C	200/s	D	600/s

30. Surface overflow rate($m^3/m^2/d$) for Secondary sedimentation tank is in the range

A	25-50	B	100-150
C	200-250	D	250-300

31. Back washing is generally used in

A	Slow sand filter	B	Rapid sand filter
C	Pressure filter	D	None of these

32. What is weir loading for a tank of diameter of 28 m and flow rate entering to tank of 880 m^3/hr

A	240 $m^3/m/d$	B	340 $m^3/m/d$
C	440 $m^3/m/d$	D	540 $m^3/m/d$

33. What is diameter of sewer if hydraulic mean depth is 0.15 m

A	0.3 m	B	0.45 m
C	0.6 m	D	0.75 m

34. What is approximate value of effective size of sand used for slow sand filter

A	0.2-0.4 mm	B	0.5-0.6 mm
C	0.6-0.8 mm	D	1-2 mm

35. To protect contamination in the distribution system, the chemical used is

A	Ozone	B	Chlorine
C	Lime	D	None of these

36. The most widely used adsorbent in India is

A	Silica	B	Activated carbon
C	Alumina	D	Lime

37. What is the approximate velocity to be maintained in horizontal flow in PST

A	0.1 m/min	B	0.3 m/min
C	0.6 m/min	D	1 m/min

38. Which method is not used for reducing TDS in softening process is

A	Reverse osmosis	B	Electrodialysis
C	Lime -Soda method	D	None of these

39. In the determination of BOD for 5 days, oxidation of organic matter completed is around

A	30-40%	B	60-70%
C	75-85%	D	85-95%

40. Trunk sewer is also called as

A	Main sewer	B	Lateral sewer
C	Outfall sewer	D	None of these

41. Basic and main important characteristic of dairy wastewater is

A	High BOD	B	High COD
C	Acidic pH	D	High Ph

42. Process involved to mix two different pH streams of wastewater is

A	Flow control	B	Flow neutralization
C	Flow adjustment	D	Flow equalization

43. Domestic wastewater is directly discharged into the water body if dilution factor is

A	Less than150	B	Between 150 to 300
C	Between 300 to 500	D	Above 500

44. The unit, in which the Velocity control device is provided is

A	Screen	B	Grit chamber
C	Primary settling tank	D	Secondary settling tank

45. Tolerance limit of TSS for sewage effluent discharged into surface water source is

A	30 mg/l	B	100 mg/l
C	200 mg/l	D	None of these

46. Recirculation factor(F) for wastewater for R/I of 1.4 for trickling filter is

A	2.85	B	2.4
C	0.85	D	1.85

47. Range of value of MCRT for conventional Activated sludge process is

A	5-15 d	B	15-25 d
C	25-35 d	D	20-30 d

48. What is HRT for ASP, when the inflow is 30 MLD and volume of 5000 m^3

A	2.5 hrs	B	4 hrs
C	6 hrs	D	12 hrs

49. For DWW, percentage of CH_4 generated from solids of sludge digestion tank is

A	30-40%	B	40-50%
C	60-70%	D	80-90%

50. Lowest BOD/COD ratio is generally found in

A	Dairy wastewater	B	Tannery wastewater
C	Distillery wastewater	D	Paper and pulp wastewater

51. “Black liquor” is generated in the process of digestion in the

A	Dairy wastewater	B	Tannery wastewater
C	Textile wastewater	D	Paper and pulp wastewater

52. What is BOD of sample if 5 ml of sample is diluted to 500 ml and loss of DO during test is 2 mg/l.

A	30 mg/l	B	100 mg/l
C	200 mg/l	D	250 mg/l

53. What is the percentage contribution of CO_2 in greenhouse effect in troposphere?

A	20%	B	30%
C	50%	D	70%

54. Depletion of ozone in the atmosphere is mainly caused by

A	Aerometric compounds	B	PAN
C	Chlorofluorocarbons	D	Nitrogenous compounds

55. Dobson unit is used to measure

A	O_3	B	SOx
C	NOx	D	CO_2

56. PAN is air pollutant, which is in the category of

A	Primary air pollutant	B	Secondary air pollutant
C	Stationary air pollutants	D	None of these

57. Oxygen carrying capacity of blood is reduced by which air pollutant

A	CO	B	CO_2
C	SO_x	D	O_3

58. Which air pollutant has no contribution in Global warming

A	CH_4	B	CO_2
C	H_2S	D	O_3

59. When mist is dense enough to obscure vision it is

A	Dense mist	B	Fog
C	Fume	D	Smoke

60. In air pollution the meaning of "soot" is as

A	Release of carbon particles after incomplete combustion	B	Release of carbon particles after complete combustion
C	Release of SOx and NOx from exhaust of vehicles	D	Release of SOx and NOx from exhaust of vehicles

61. Air pollutant causing yellowish pattern in plant leaves is called

A	Necrosis	B	Chlorosis
C	Abscission	D	Epinasty

62. Arsines pollutants can cause

A	Damages to Kidney	B	Nausea
C	Asthma	D	Eye irritation

63. Particulates as well as gaseous pollutants are simultaneously removed by

A	Scrubbers	B	Fabric filters
C	Cyclone separators	D	Gravity settlers

64. As per ambient air quality standards SO_2 concentration in 24 hrs in air is

A	40 $\mu g/m^3$	B	60 $\mu g/m^3$
C	80 $\mu g/m^3$	D	120 $\mu g/m^3$

65. Carbon monoxide concentration in 8 hrs in atmosphere, as per ambient air quality is

A	2 $\mu g/m^3$	B	10 $\mu g/m^3$
C	20 $\mu g/m^3$	D	30 $\mu g/m^3$

66. How many times more reactive is CO compared to O_2 with hemoglobin

A	50	B	100
C	150	D	200

67. Metal used as catalyst along with Platinum to prevent lead poisoning in exhaust of cars

A	Copper	B	Gold
C	Bronze	D	Palladium

68. Low intensity sounds are measured on scales as

A	dBA	B	dBB
C	dBC	D	dB

69. Noise level for rail traffic is around

A	50-60 dB	B	70-80 dB
C	90-110 dB	D	120-150 dB

70. What is the limit of sound level in Industrial area as per ambient noise standards

A	45-55 dB	B	65-75 dB
C	95-105 dB	D	105-120 dB

71. What is the range of moisture content during the composting process

A	10-20%	B	30-40%
C	50-60%	D	70-80%

72. Waste minimization, resource conservation and recovery of by product is a major goal of

A	EIA	B	EPA
C	CPCB	D	WHO

73. For any project EIS report is prepared for

A	Feedback of people	B	Approval or rejection of project
C	Sustainable development	D	None of these

74. In which method of the following, there is sludge generation problem

A	Reverse osmosis	B	Electrodialysis
C	Lime -Soda method	D	None of these

75. Main cause of rising sludge in ASP is

A	Nitrification	B	Denitrification
C	Acidification	D	Neutralization

76. Detention time for high rate digestion process is around

A	15 d	B	30 d
C	45 d	D	60 d

77. Well designed and operated sludge thickeners should at least reduce sludge volume by

A	10%	B	20%
C	30%	D	50%

78. Typical Indian solid waste has calorific value which is in the range of

A	500-800 kcal/kg	B	800-1000 kcal/kg
C	1200-1800 kcal/kg	D	2000-2500 kcal/kg

79. Complete destruction of pathogens from solid waste is achieved in the process of

A	Incineration	B	Open window Composting
C	Land filling	D	Mechanical composting

80. Which of these solid waste disposal technologies is Environmental friendly?

A	Mechanical composting	B	Incineration
C	Plasma Pyrolysis	D	Sanitary land filling

81. Laplace Transform is a……

A	Linear transform	B	Binomial transform
C	Canonical transform	D	None of these

82. The Particular Integral of $(D^2+D-2)y=e^x$

A $\frac{xe^2}{3}$ B $\frac{xe^2}{4}$

C $\frac{xe^2}{5}$ D $\frac{xe^2}{6}$

83. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

A $\frac{1}{2}$ B $\frac{2}{5}$

C $\frac{8}{15}$ D $\frac{9}{20}$

84. If $f(x)=x\left[\sqrt{x}-\sqrt{x+1}\right]$ then

A *f(x)* is continuous but not differentiable at x=0. B f(x) is differentiable at x=0

C f(x) is not differentiable at x=0 D None of these

85. If . $f(x)=\begin{cases}1, & x<0\\ 1+\sin x, 0\le x\le \pi/2\end{cases}$ then at x=0, the derivative $f'(x)$ is.

A 1 B 0

C Infinite D does not exist

86. Which of the following substitution reduce the differential equation $\frac{dz}{dx}+\frac{z}{x}\log z=\frac{z}{x^2}(\log z)^2$ in to the form $\frac{du}{dx}+P(x)u=Q(x)$?

A $u=\log z$ B $u=e^z$

C $u=(\log z)^{-1}$ D $u=(\log z)^2$

87. Which of the following could represent a function, *f*(*x*, *y*), with first-order partial derivatives? $f_x(x,y,z)=3xy(xy+2)$, $f_y(x,y,z)=x^2(2xy+3)$

A $f=x^2y(xy+3)-6$ B $f=xy(x^2y+3)$

C $f=x^3y^2+2x^2y^3+1$ D None of these

88. The fixed point of the transformation $W = Z^2$ are

A	0,1	B	0,-1
C	-1,1	D	$i.-i$

89. Following are the values of a function $y(x): y(-1)=5, y(0), y(1)=8$ $\frac{dy}{dt}$ at $x=0$ as per Newton's central difference scheme is

A	0	B	1.5
C	2.0	D	3.0

90. $L\left(t^2 \sin(2t)\right)$.

A	$\frac{12s^2-16}{\left(s^2+4\right)^4}$	B	$\frac{3s^2-4}{\left(s^2+4\right)^3}$
C	$\frac{12s^2-16}{\left(s^2+4\right)^6}$	D	$\frac{12s^2-16}{\left(s^2+4\right)^3}$

91. To solve $(D^2+16)y = tan4x$ by Variation of parameter, then wronskian W is :

A	4	B	3
C	2	D	None of these

92. If $f(x,y,z) = x^2 + y^2 + z - 9 = 0$ then the tangent plane at the point $P_0(1,2,4)$ is

A	$2x+4y+z=14$	B	$2x-4y+z=14$
C	$2x+4y-z=14$	D	$2x+2y+z=14$

93. The general solution of $(x+1)^2 y''+(x+1)y'+y=0$ is :

A	C1 Cosx + C2 Sinx	B	C1 Cos(lnx) + C2 Sin(lnx)
C	$(C_1 + C_2\, x)e^x$	D	None of these

94. A Partial differential equation has.

A	One indepdent variable	B	Two or more indepdent variables
C	More than one dependent variable	D	Equal number of dependent and independent variables.

95. The partial differential equation $5\frac{\partial^2 u}{\partial x^2}+6\frac{\partial^2 u}{\partial y^2}=xy$ is classified as

A	elliptic	B	Parabolic
C	hyperbolic	D	None of the above.

96. The root of $x^3-2x-5=0$ correct to three decimal places by using Newton-Raphson method is.

A	2.0946	B	1.0404
C	1.7321	D	0.701.

97. Find the equations of normal line to the surface $x^2+2y^2+z=3$ at point (2,1,-3)

A $\frac{x-2}{4}=-\frac{y-1}{1}=\frac{z+3}{1}$ B $\frac{x-2}{8}=\frac{y-1}{1}=\frac{z+3}{1}$

C $\frac{x-2}{4}=\frac{y-1}{1}=\frac{z+3}{2}$ D $\frac{x-2}{4}=\frac{y-1}{4}=\frac{z+3}{1}$

98. The general solution of $(x^2D^2-3xD+4)y=0$ is :

A $C_1 e^{2X} + C_2 e^{-2x}$ B $(C_1 + C_2x)e^{2x}$

C $(C_1 + C_2 \ln x)x^2$ D None of these

99. Number of observations are 30 and value of arithmetic mean is 15 then sum of all values is

A 15 B 450

C 200 D 45

100. In which of the following methods, proper choice of initial value is very important?

A Bisection method B False position

C Newton-Raphson D Bairsto method