

PGCET - 2023

SUB: Environmental Engineering

Seat No. _____

Instructions:

Time: 1 Hour 30 Minutes

- 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.	pH=3 when compared to pH=5 , will be more acidic by have hydroxyl ion concentration, equal to:			
	A	2 times	B	20 times
	C	100 times	D	1000 times
2.	The specific conductivity of the water helps in knowing the extend of			
	A	Organic matter	B	Inorganic matter
	C	Dissolved salt	D	Settleable Solids
3.	The suspended solids present in water may give colour to the water which is known as			
	A	True colour	B	Apparent colour
	C	Light Colour	D	Dark colour
4.	The disease "Methaemoglobinaemia" is cause when drinking water supply contains the high concentration of			
	A	Fluoride	B	Iron
	C	Nitrite	D	Nitrate
5.	The measure of the amount, to which light is adsorbed or scattered by suspended material in water, is called			
	A	Opacity	B	Turbidity
	C	Celerity	D	Diffraction
6.	As per IS 10500:2012, for drinking water in the absence of alternate source of water, the permissible limits for chloride and sulphate, in mg/L, respectively are			
	A	250 and 200	B	200 and 250
	C	1000 and 400	D	500 and 1000

7.	If the hardness of water is 1meq/L, its equivalent concentration in mg/L as CaCO_3 is			
	A	150mg/L	B	50mg/L
	C	100mg/L	D	250mg/L
8.	The population of a town in three consecutive decades are: 2 lakh, 2.6 lakh, 3.12 lakh respectively. The population of this town in the fifth consecutive decade, according to geometric method would be			
	A	4.875 lakh	B	3.625 lakh
	C	3.965 lakh	D	4.3 lakh
9.	Type II settling in water treatment is defined as:			
	A	Settling of discrete particles in dilute suspensions	B	Settling of flocculant particles in dilute suspensions
	C	Settling of flocculant particles in concentrated suspensions	D	Settling of particles in the form of sludge blanket
10.	A single speed centrifugal pump, feeding a small water supply distribution system of a block of houses, work at:			
	A	Maximum efficiency	B	Minimum efficiency
	C	Reduced efficiency	D	Remains unaffected
11.	The quantity of alum required in order to treat 13 million litres of water per day at treatment plant, where 12ppm of alum dose is required is 156 kg. The amount of carbon dioxide that will be released in this process is			
	A	4.76kg	B	61.84kg
	C	10.3kg	D	50.07kg
12.	The chlorine demand of a water sample was found to be 0.2mg/L. The amount of bleaching powder containing 30% available chlorine to be added to treat one litre of such a water sample is			
	A	0.67mg	B	0.06mg
	C	1.33mg	D	0.14mg
13.	For proper slow mixing in the flocculator of a water treatment plant, the temporal mean velocity gradient G needs to be order of			
	A	5 to 10 per second	B	100 to 200 per second
	C	10 to 75 per second	D	250 to 300 per second

14.	If the average daily water consumption of a city is 30,000 cum, the peak hourly demand (of the maximum day of course) will be			
	A	2000 cum/hr	B	2750 cum/hr
	C	1500 cum/hr	D	3375 cum/hr
15.	The distribution system in water supplies is designed on the basis of			
	A	Average daily demand	B	Coincident draft
	C	Peak hourly demand	D	Greater of peak hourly demand and coincident draft
16.	Which of the following statements about design period is not true			
	A	it is concerned with economy of investment	B	it consider the frequency of occurrence of extreme of river flow
	C	it takes into account aspects of life and durability and ease or difficulty of capacity increase of installation	D	it is concerned with estimating future requirements
17.	A river is the source of water for water supply to a town. Its water is very turbid and polluted. The correct sequence of steps for treating the river water would be			
	A	presedimentation -> prechlorination -> coagulation -> sedimentation -> filtration -> post chlorination	B	coagulation -> filtration -> sedimentation -> post chlorination
	C	coagulation -> sedimentation -> post chlorination	D	sedimentation -> post chlorination
18.	Coagulants, used in water treatment, functions better when raw water is:			
	A	Acidic	B	Neutral
	C	Alkaline	D	Remains unaffected by acidity or alkalinity
19.	Well oxidized sewage will contain nitrogen largely in the form of			
	A	Nitrites	B	Free ammonia
	C	Nitrates	D	Nitrogen
20.	For design of sewers in India, the percentage of sewage discharge, is assumed as			
	A	25-35% of water supplied from water works	B	75-80% of water supplied from water works
	C	100% of water supplied from water works	D	50% of water supplied from water works

21.	Insertion of safety lamp in the upper portion of a manhole, causing flames, surely indicates in sewer, the presence of:			
	A	Hydrogen sulphide gas	B	Methane gas
	C	Carbon dioxide gas	D	Petrol vapours
22.	Complete, thorough treatment should generally be given to sewage, before it's disposal in a stream, if the dilution factor available is,			
	A	Less than 350	B	Less than 150
	C	Less than 250	D	More than 250
23.	The ratio of the design discharge to the surface area of a sedimentation tank is known as its:			
	A	Surface loading	B	Scour velocity
	C	Weir loading	D	Horizontal velocity
24.	Ultimate BOD of a given sewage depends upon its			
	A	Temperature	B	Flow velocity
	C	Initial organic matter	D	Viscosity of sewage
25.	For a wastewater, the 5-day BOD at 20 deg. C is found to be 200 mg/L. For the same waste, 5-day BOD at 30 deg. C will be:			
	A	Less than 200 mg/L	B	200 mg/L
	C	More than 200 mg/L	D	Zero, as the bacteria cannot withstand such a high temperature
26.	Which one of the following statements is correct? In dissolved oxygen sag curve, the sag results because			
	A	It is a function of a rate of addition of oxygen to the stream	B	It is a function of both addition and depletion of oxygen from the stream
	C	It is a function of a rate of addition of oxygen from the stream	D	The rate of addition of oxygen is linear but the rate of depletion is nonlinear
27.	Which of the following reactor can create a problem of short circuiting due to density currents?			
	A	Batch	B	Plug flow
	C	Complete mix	D	Fluidized bed

28.	A drain carrying sewage of BOD= 200 mg/L and flow rate of 50 cum. per second joins a river whose upstream BOD is 8 mg/L and flow rate is 500 cum. per second. Assume immediate and complete mixing of drain with the river. What is the estimated downstream BOD of the river flow?			
	A	20.4 mg/L	B	104.4 mg/L
	C	25.4 mg/L	D	70.4 mg/L
29.	A municipal sewage has BOD ₅ of 200 mg/L. It is proposed to treat and dispose off into a marine environment. For what minimum efficiency should the sewage treatment plant be designed?			
	A	85%	B	50%
	C	60%	D	33.67%
30.	What is theoretical oxygen demand of 360mg/L glucose solution?			
	A	385mg/L	B	300mg/L
	C	400mg/L	D	320mg/L
31.	One litre of sewage, when allowed to settle for 30 minutes gives sludge of 27cm ³ . If the dry weight of sludge is 3.0 gm, then its sludge volume index will be:			
	A	9 ml/gm	B	30 ml/gm
	C	24 ml/gm	D	81 ml/gm
32.	If the moisture content of a sludge is reduced from 98% to 96%, the volume of sludge will decrease by:			
	A	2%	B	25%
	C	20%	D	50%
33.	In transition of sewers from smaller diameter sewers to larger diameters sewers, the continuity of sewers is maintained at the:			
	A	Bottom of concrete bed of sewers	B	Crowns of sewers
	C	Invert of sewers	D	Hydraulic gradient of sewers
34.	Lower F/M value in a conventional activated treatment plant will mean			
	A	Higher BOD removal	B	No effect on BOD removal
	C	Lower BOD removal	D	None of above

35.	A wastewater is to be disinfected with 35mg/L of chlorine to obtain 99% kill of microorganisms. The number of micro-organisms remaining alive (N_t) at time t , is modeled by $N_t = N_0 e^{-kt}$, where N_0 is number of microorganisms at $t = 0$, and k is the rate of kill. The wastewater flow rate is 36m ³ /h, and $k = 0.23$ min ⁻¹ . If the depth and width of the chlorination tank are 1.5 m and 1.0m, respectively, the length of the tank in m, is _____			
	A	8.0m	B	12.0m
	C	14.6m	D	10.5m
36.	The sewer pipes have to be designed and checked for			
	A	Only maximum flow	B	Only minimum flow
	C	Both maximum and minimum flow	D	None of them
37.	The phenomenon by virtue of which a soil is clogged with sewage matter, is called			
	A	Sewage farming	B	Sewage sickness
	C	Sewage bulking	D	None of these
38.	Noise can be defined as			
	A	Change frequency of vibration	B	Change in pressure level of air
	C	Change in magnitude	D	sound with unacceptable pressure and frequency
39.	Which type of Noise can be abated by providing lining on walls and ceiling with sound absorbing material?			
	A	Source noise	B	Reflection noise
	C	Structural noise	D	Direct air-borne noise
40.	Two sources generate noise levels of 90dB and 94dB respectively. The cumulative effect of those two noise level on human ear is			
	A	184dB	B	95.5dB
	C	98dB	D	100dB
41.	An Environmental Impact Assessment is intended to identify the environmental, social and economic impacts of proposed development:			
	A	Prior to the decision to sanction a project is taken	B	During the execution of a project
	C	After the execution of a project to assess its beneficiaries	D	None of the above

42.	An Environmental Impact Statement should include:			
	A	Description of the project with location, design, size etc.	B	Description of its significant effects on environment and society
	C	Mitigating measures to reduce the possible adverse impacts	D	All of above
43.	The 'scoping' during the EIA process under Indian EIA notification 2006 is applicable to			
	A	'A' category of projects	B	'B1' category of projects
	C	'B2' category of projects	D	(a) and (b) both
44.	During the EIA process under India's EIA notification 2006, public consultation is must for:			
	A	All 'A' category projects	B	All 'A' category projects except for a few exceptional ones
	C	All 'B1' category projects	D	All 'A' and 'B1' category projects except for a few exceptional ones
45.	Under Water Act, functions of State Board include			
	A	To advise the State Government on any matter concerning the prevention, control or abatement of water pollution	B	To lay down, modify or annul effluent standards for the sewage and trade effluents and for the quality of receiving waters (not being water in an inter-State stream) resulting from the discharge of effluents and to classify waters of the State
	C	To collect and disseminate information relating to water pollution and the prevention, control or abatement thereof	D	All of above
46.	Objectives of THE ENVIRONMENT (PROTECTION) ACT, 1986 are			
	A	Protection and improvement of environment	B	Prevention of hazardous to all leaving creatures (humans, plants, animals) and property
	C	Maintenance of harmonious relationship between human beings and their environment.	D	All of above

47.	According to Hazardous Waste Management Rules, Responsibilities of the occupier for management of hazardous and other wastes are			
	A	The occupier shall be responsible for safe and environmentally sound management of hazardous and other wastes.	B	Ensure recognition and registration of workers involved in recycling, preprocessing and other utilization activities
	C	Assist formation of groups of such workers to facilitate setting up such facilities	D	Undertake industrial skill development activities for the workers involved in recycling, pre-processing and other utilization
48.	Baseline survey for EIAs includes information on existing			
	A	Air quality	B	Land use
	C	Water resources	D	all of above
49.	Which of the following methods is generally not adopted for safe disposal of biomedical wastes?			
	A	Hydroclaving	B	Shredding after disinfection
	C	Incineration	D	Landfilling
50.	Which of the following is not major constituent of a photochemical smog?			
	A	CO	B	PAN
	C	HC	D	O ₃
51.	During temperature inversion in atmosphere air pollutants tend to:			
	A	Accumulate above inversion layer	B	Accumulate below inversion layer
	C	Disperse laterally	D	Disperse vertically
52.	The air pollutant which cause severe damage to plants even at much lower concentration than what may be harmful to human health is			
	A	Fluorine	B	Ozone
	C	PAN	D	None of them
53.	According to NAAQS permissible annual average concentration of NO ₂ for Ecologically sensitive area (notified by Central Govt.) is			
	A	30 µg/m ³	B	60 µg/m ³
	C	40 µg/m ³	D	80 µg/m ³
54.	The device which can be used to control gaseous as well as particulate emission in industrial emission is known as			
	A	Cyclone	B	Spray tower
	C	Dynamic precipitator	D	Fabric filter
55.	Which of the following materials are used as landfill sealants for the control of gas and leachate movements?			
	A	Lime & Sand	B	Sand & Fly ash
	C	Lime & Fly ash	D	Bentonite & Butyl Rubber

56.	Aerobic method of composting practiced in India is called			
	A	Banglore method	B	Nagpur method
	C	Delhi Method	D	Indore Method
57.	The term ‘Refuse’ generally does not include:			
	A	Putrescible solid waste	B	Excreta
	C	Non-putrescible solid waste	D	Ashes
58.	Which of the following statement explains the term pyrolysis?			
	A	Solid waste is heated in closed containers in oxygen free atmosphere	B	Solid waste is incinerated in presence of oxygen
	C	Waste water is treated with oxygen	D	Waste water is treated without oxygen
59.	In a shallow waste stabilization pond , the sewage is treated by :			
	A	Aerobic bacteria only	B	Algae only
	C	Dual action of bacteria & algae	D	sedimentation
60.	Which one of the following Acts/Rules has a provision for “No right to appeal”.			
	A	Environmental (Protection) act 1986	B	Hazardous Wastes (Management and. Handling) Rules 1989
	C	Manufacture, storage and import of hazardous chemical rules, 1989	D	Environmental (Protection) Rules 1992
61.	When there is no circulation of treated sewage in high rate biological filtration of sewage, then the recirculation factor is :			
	A	1	B	0
	C	Infinity	D	None of the above
62.	Which one of the following parameter is not included in the routine characterization of solid waste for its physical composition?			
	A	Moisture content	B	Density
	C	Particle size analysis	D	Energy value

63.	Objectives of the Environment Audit Scheme are			
	A	Enforcing discipline amongst the industries.	B	Arming GPCB as well as the Associations of industries in the concerned areas with the necessary information.
	C	Doing regular monitoring of different industries scattered in the entire State of Gujarat with a perspective of environmental protection & sustainable development.	D	All of above
64.	For MSW management, responsibility of municipal authority includes			
	A	collection	B	segregation
	C	Transportation	D	all above
65.	MSW characterization does not include following property			
	A	Physical	B	chemical
	C	Radioactivity	D	biological
66.	Method recommended to measure particulate matter is			
	A	Spectrophotometry	B	UV rays
	C	Gravimetric	D	None of the above
67.	CO is measured by			
	A	Spectrophotometry	B	NDIR technique
	C	UV rays	D	None of the above
68.	Neutralization is required			
	A	After biological treatment	B	During biological treatment
	C	Before biological treatment	D	None of the above
69.	<p>An industry manufacturing urea produces wastewater, which largely contains urea and ammonia. The treatment plant consists of the following units, for effective control of nitrogen:</p> <ol style="list-style-type: none"> 1. Nitrification followed by denitrification 2. Hydrolysis unit 3. Ammonia stripping by air 4. Lime dosing and mixing unit <p>Which one of the following is the correct sequence of above unit operations in treatment plant?</p>			
	A	3-2-1-4	B	2-3-1-4
	C	2-4-3-1	D	4-2-3-1

70.	Plants with diversity of manufacturing processes requires			
	A	Waste minimization tank	B	Biological treatment tank
	C	Waste equalization tank	D	Chemical treatment tank
71.	Assuming annual travel for each vehicle to be 20,000km, what is the quantity of NO ₂ produced from 50,000 vehicles with emission rate of 2.0gm/km/vehicle?			
	A	1800 tones	B	1900 tones
	C	2000 tones	D	2100 tones
72.	Uniformity coefficient of filter sand is given by			
	A	D ₅₀ /D ₅	B	D ₆₀ /D ₅
	C	D ₆₀ /D ₅₀	D	D ₆₀ /D ₁₀
73.	The Gaussian model is used for prediction of concentration of pollutants from			
	A	Line source	B	Single Point source
	C	Plane source	D	All of the above
74.	The movement of solvent through a membrane that is impermeable to the solute is			
	A	Osmosis	B	Adsorption
	C	Dialysis	D	None of above
75.	The Ca ⁺² concentration and Mg ⁺² concentration of a water sample are 160mg/L and 40mg/L as their ions respectively. The total hardness of this water sample in terms of CaCO ₃ in mg/L is a approximately equal to			
	A	120	B	200
	C	267	D	567
76.	Desizing, Scouring, Bleaching, Mercerizing, dyeing, printing are the processes involved in			
	A	Textile industry	B	Dye industry
	C	Dye intermediate industry	D	Paper Industry
77.	The valve, which allows the flow only in one direction, is a:			
	A	Reflux valve	B	Sluice valve
	C	Gate valve	D	None of these

78.	The purpose of re-carbonation after lime soda process of water softening is the			
	A	Removal of excess soda from water	B	Removal of non-carbonate hardness
	C	Recovery of lime	D	Conversion of precipitates to soluble form
79.	Air-binding in rapid sand filters is encountered when			
	A	There is excessive negative head	B	The water is subjected to prolonged aeration
	C	The raw water contains dissolved gases	D	The filter bed comprises largely of coarse sand
80.	The purpose of providing a balancing reservoir in a water supply distribution system is to			
	A	Equalize pressure in the distribution system	B	Store adequate quantity of water to meet requirements in case of breakdown of flow
	C	Store adequate firefighting reserve	D	Take care of fluctuations in the rate of consumption
81	Solution of differential equation $(2xy + e^y)dx + (x^2 + xe^y)dy = 0$ is given by			
	A	$xy + x^2e^y = c$	B	$x^2y + xe^y = c$
	C	$xy^2 + x^2e^y = c$	D	$xy + ye^y = c$
82	Solution of differential equation $\frac{d^2y}{dx^2} - 25y = \cos^2x$ is given by			
	A	$y = c_1e^{-5x} + c_2e^{5x} - \frac{1}{50} - \cos 2x$	B	$y = c_1e^{-5x} + c_2e^{5x} - \frac{1}{58} \cos 2x$
	C	$y = c_1e^{-5x} + c_2e^{5x} - \frac{1}{50} - \frac{1}{58} \cos 2x$	D	$y = c_1e^{-x} + c_2e^x - \frac{1}{50} - \frac{1}{58} \cos 2x$
83	Laplace Transformation of $t \cos 9t$ is equal to			
	A	$\frac{s^2}{(s^2 + 81)^2}$	B	$\frac{81}{(s^2 + 81)^2}$
	C	$\frac{81s^2}{(s^2 + 81)^2}$	D	$\frac{s^2 - 81}{(s^2 + 81)^2}$
84	Inverse Laplace Transformation of $\frac{s-9}{(s^2-18s+97)}$ is equal to			
	A	$e^{9t} \cos 4t$	B	$e^{-9t} \cos 4t$
	C	$e^{9t} \sin 4t$	D	$e^{-9t} \sin 4t$

85	$\lim_{x \rightarrow 1} \left(\frac{e^{x-1} - x}{(x-1)^2} \right)$ is equal to			
	A	2	B	0
	C	$\frac{1}{2}$	D	1
86	If $U = \frac{x^2 y}{x+y}$ then $x \frac{\partial U}{\partial x} + y \frac{\partial U}{\partial y}$ is equal to			
	A	U	B	0
	C	1	D	2U
87	If $\phi = \tan^{-1}\left(\frac{y}{x}\right)$ then $\text{div}(\text{grad}\phi)$ is equal to			
	A	1	B	0
	C	2	D	3
88	Vector Field $\vec{F} = (x^4 y z)i - (2x^3 y^2 z)j + x^3 y^3 k$ is			
	A	Solenoidal vector Field	B	Irrotational vector field
	C	Both (A) and (B)	D	None of these
89	Which of the following is correct for the system $2x + 3y + z = 2, \quad x + y + 5z = 3, \quad 3x + 4y + 6z = 5$			
	A	Unique solution	B	No solution
	C	Infinitely Many solution	D	None of these
90	If $A = \begin{bmatrix} 5 & 0 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 3 \end{bmatrix}$ then an Eigen values of A^{-1} are			
	A	1, 3, 5	B	$\frac{1}{2}, \frac{1}{3}, \frac{1}{6}$
	C	$\frac{1}{2}, \frac{1}{3}, \frac{1}{5}$	D	$1, \frac{1}{3}, \frac{1}{5}$
91	If $A = \begin{bmatrix} 1 & 0 & 0 \\ 4 & 0 & 5 \\ 0 & 1 & 0 \end{bmatrix}$ then rank of the matrix A is.			
	A	1	B	3
	C	2	D	0

92	If $f(z) = \frac{z^2-4}{(z-1)(z^2+4z+4)}$ which are the points where $f(z)$ fails to be analytic ?			
	A	-1,-2	B	1,2
	C	-1,2,	D	1,-2
93	Value of $\int_c \frac{1}{(z-5)^2} dz$, (where c is $ z = 3$) is.			
	A	πi	B	$2\pi i$
	C	0	D	$3\pi i$
94	Residue of $f(z) = \frac{z-2}{(z-3)(z-5)}$ at pole 5 is.			
	A	3/2	B	1/2
	C	5/2	D	1/3
95	The Mean, Median and mode of 12, 14, 18, 17, 14 are.			
	A	Mean=15, Median=14, Mode=13	B	Mean=14, Median=15, Mode= 14
	C	Mean=14, Median=15, Mode=15	D	Mean=15, Median=14, Mode= 14
96	If A and B are independent event where $P(A)=2/3$ and $P(B)=1/4$ then $P(A \cup B)$ is			
	A	1/4	B	1/3
	C	3/4	D	1/6
97	The lifetime T of an alkaline battery is exponentially distributed with $\lambda = 0.02$ per hour. What is the mean of the battery life time ?			
	A	60 hrs.	B	50 hrs.
	C	55 hrs.	D	65 hrs.
98	Value of $\int_0^4 \frac{1}{3+2x} dx$ with $h = 1$ by Simpsons $\frac{1}{3}$ rule is.			
	A	0.78	B	0.68
	C	0.58	D	0.61

99	A numerical solution of the equation $f(x) = x^3 + 2x - 5 = 0$ can be obtained using Newton-Raphson method. If the initial guess $x_0 = 1$ for the iteration then what is the value of first iteration?			
	A	1.4	B	2.4
	C	1.14	D	0.14
100	If $\frac{dy}{dx} = 3x + y$ and $y(0) = 1$, taking $h=0.1$ using second order Runge-Kutta method what is the value of $y(0.1)$?			
	A	1.52	B	0.52
	C	2.12	D	1.12