

CODE: AE-EV

M.Tech. Common Entrance Test, PGCET – 2010

## Environmental Engineering

Time: 2 Hours

Max. Marks: 100

### Read the following instructions before answering the test

- i) Write / Darken the particulars of your identity, Test Seat Number and put your signature on the OMR Response Sheet before the start of the test.
- ii) All Questions have multiple choices of answers, of which only one is correct.
- iii) Mark the correct answer by completely shading only one oval against the Question number using Black Ink Ball Point pen only.
- iv) There will be no negative evaluation with regard to wrong answers. Marks will not be awarded if multiple answers are given.
- v) Do not make any stray mark on the OMR Response sheet. For rough work, use blank page on the question paper.
- vi) Taking the question paper out of the test hall is permitted only after the full duration of the test.
- vii) Use of only non-programmable calculator is permitted.
- viii) **START ANSWERING ONLY AT THE SPECIFIED TIME WHEN THE INVIGILATOR GIVES INSTRUCTIONS.**

### MARKS DISTRIBUTION

PART – I	50 Questions :	50 x 1 =	50 Marks
PART – II	25 Questions :	25 x 2 =	50 Marks
		Total =	100 Marks

## PART – I

Each Question carries One mark

- The volume of fluid per unit weight is  
a) Specific gravity    b) Specific weight    c) Specific volume    d) None of these
- The process of treating water by applying pressure greater than the osmotic pressure solute on one side of a membrane is  
a) Reverse Osmosis    b) Electrodialysis  
c) Ion Exchange    d) Electrolytic membrane
- The adsorption capacity of activated carbon is determined by the use of  
a) Freundlich Isotherm    b) Langmuir Isotherm  
c) BET Isotherm    d) All of these
- The oxygen consuming property of the wastewater expressed in terms of oxygen that consumed biologically is  
a) BOD    b) COD    c) TOC    d) All of these
- The absence of fluorides in drinking water encourages  
a) Dental Carries    b) Dental Fluorosis  
c) Methemoglobinemia    d) None of these
- The net primary productivity in plant matter is equal to  
a) Gross primary productivity – Plant respiration  
b) Gross primary productivity + Plant respiration  
c) Gross primary productivity  
d) None of these
- The primary constituent of living matter which move through a gaseous cycle is  
a) Hydrogen    b) Carbon    c) Nitrogen    d) All of these
- In an ecosystem, the flow of energy is  
a) Bi-directional    b) Cyclic    c) Unidirectional    d) Multidirectional
- The primary producers in a forest ecosystem are  
a) Chlorophyll containing trees and plants    b) Herbivores  
c) Carnivores    d) Bacteria and other microorganisms
- Eutrophication is  
a) an improved quality of water in lakes  
b) a process in carbon cycle  
c) accumulation of plant nutrients in water bodies  
d) accumulation of heavy metals in water bodies
- Fluids which have no viscosity and surface tension and which are incompressible are  
a) Ideal fluids    b) Practical fluids    c) Real fluids    d) None of these

12. When a certain pressure is applied at any point in a fluid at rest, the pressure is equally transmitted in all directions and to every other point in the fluid is  
 a) Darcy's Law      b) Pascal's Law      c) Newton's Law      d) Stoke's law
13. When a main pipeline divides into two or more parallel pipes which again join together is  
 a) Pipes in parallel      b) Equivalent pipe      c) Pipes in series      d) None of these
14. A centrifugal pump which discharge a unit flow under a unit head at maximum efficiency is  
 a) Brake Horse Power      b) Specific Speed  
 c) Hydraulic Ram      d) None of these
15. From the construction point of view, wells with an impervious lining, such as masonry lining and generally resting on a mota layer is  
 a) Type I      b) Type II      c) Type III      d) None of these
16. The strainer generally used in tube well construction is  
 a) Continuous slot type      b) Shutter type  
 c) Coir rope type      d) All of these
17. If the precipitation is caused by the lifting of an air mass due to pressure difference is  
 a) Cyclonic Precipitation      b) Convective Precipitation  
 c) Orographic Precipitation      d) None of these
18. If within zone of saturation, an impervious deposit below a pervious deposit is found to support a body of saturated materials then the body of saturated material is  
 a) Unconfined Aquifer      b) Confined Aquifer  
 c) Perched Aquifer      d) None of these
19. The total amount of dissolved salts present in water can be easily estimated by measuring the  
 a) Specific Conductivity      b) Turbidity  
 c) Total Solids      d) None of these
20. The presence of too much of nitrate in water may adversely affect the health of infants causing a disease called  
 a) Minamata Disease      b) Cholera  
 c) Methemoglobinemia      d) Bacillary Dysentery
21. The permissible limit of hardness in drinking water as specified by BIS is  
 a) 750 mg/L      b) 1450 mg/L      c) 75 mg/L      d) 7.5 mg/L
22. The sedimentation of particle in water brought to rest is opposed by  
 a) Velocity of flow      b) Viscosity of water  
 c) Size, shape & specific gravity of particle      d) All of these
23. The rate of filtration in rapid gravity filters is  
 a) 100 to 200 litres per hour per sq. m of filter area  
 b) 3000 to 6000 litres per hour per sq. m of filter area  
 c) 100 to 200 litres per minute per sq. m of filter area  
 d) 3000 to 6000 litres per minute per sq. m of filter area

24. The method of removing permanent hardness is  
 a) By boiling  
 b) By addition of Lime  
 c) By Lime-Soda process  
 d) By Chlorination
25. The peaking factor is given by  
 a) Maximum flow / Average flow  
 b) Minimum flow / Average flow  
 c) Minimum flow / Maximum flow  
 d) Maximum flow / Minimum flow
26. The average time in days for which biomass are retained in the biological reactor is  
 a) Mean cell residence time  
 b) Hydraulic retention time  
 c) Over flow rate  
 d) F/M ratio
27. A grit chamber may be  
 a) Rectangular horizontal flow type  
 b) Square horizontal flow type  
 c) Aerated type  
 d) All of these
28. A treatment unit mainly provided to remove a large portion of suspended material which is inorganic in nature  
 a) Grit chamber  
 b) Flotation unit  
 c) Primary sedimentation tank  
 d) Secondary sedimentation tank
29. The national research council equation is used to design the  
 a) Aeration tank of ASP  
 b) Trickling filters  
 c) Oxidation pond  
 d) Anaerobic digesters
30. In anaerobic sludge digestion if the higher molecular weight compounds of sludge are converted to low molecular compounds suitable for use as a source of energy and cell carbon by microorganisms is  
 a) Hydrolysis  
 b) Acidogenesis  
 c) Methanogenesis  
 d) None of these
31. The strength of industrial wastewater may be reduced by  
 a) Process changes  
 b) Equipment modifications  
 c) by-product recovery  
 d) All of these
32. The combustible and non-combustible portion of solid waste excluding food waste is  
 a) Trash  
 b) Garbage  
 c) Rubbish  
 d) None of these
33. If the container is hauled from the collection point to the final point of disposal or processing facility is  
 a) Stationary container system  
 b) Hauled container system  
 c) Curb or alley method  
 d) None of these
34. The primary pollutants in smog are  
 a) Nitric Oxide & Hydrocarbons  
 b) Ozone & Organic Nitrates  
 c) Photochemical Aerosols  
 d) All of these
35. The region of the atmosphere closest to the earth surface is  
 a) Stratosphere  
 b) Mesosphere  
 c) Troposphere  
 d) Thermosphere

The Air (Prevention & Control of Pollution) Act was enacted in the year

- a) 1981                      b) 1996                      c) 2000                      d) 1974

The polluting gas, which is primarily responsible for causing the green house effect and global warming is

- a) Sulphur dioxide                      b) CO<sub>2</sub>                      c) Nitrous Oxide                      d) Sulfur hexa fluoride

The electrostatic precipitators remove

- a) Nitrogen oxide                      b) Hydrocarbons                      c) Particulate matter                      d) Both (a) and (b)

The gaseous pollutants emissions may be controlled by

- a) Absorption                      b) Adsorption                      c) Incineration                      d) All of these

When ambient lapse rate exceeds adiabatic lapse rate than the lapse rate is called as

- a) Dry adiabatic lapse rate                      b) Sub adiabatic lapse rate  
c) Super adiabatic lapse rate                      d) None of these

The Gibbs free energy, G is equal to

- a)  $H - TS$                       b)  $H + TS$                       c)  $HS - T$                       d)  $HT - S$

Biochemical Oxygen Demand is an example of

- a) Zero Order Reaction                      b) First Order Reaction  
c) Second Order Reaction                      d) None of these

Nitrification process in a stream is

- a) Consecutive reaction                      b) Zero Order Reaction  
c) Enzyme Reaction                      d) None of these

The principal characteristics of rivers include

- a) Geometry                      b) Velocity                      c) Mixing characteristics                      d) All of these

In the river body itself the sources of DO are

- a) Reaeration from atmosphere                      b) Photosynthetic oxygen production  
c) DO from incoming tributaries                      d) All of these

The groundwater arsenic contamination is noted more in

- a) Rajasthan                      b) Andhra Pradesh                      c) Karnataka                      d) West Bengal

The analytical functions associated with environmental impact assessment include

- a) Defining scope of EIA                      b) Prediction  
c) Impact evaluation and analysis                      d) All of these

The screening criteria in environmental impact assessment is based on

- a) Scales of investment                      b) Type of development  
c) Location of development                      d) All of these

49. The difference between Comprehensive EIA and Rapid EIA is in the
- Time-scale of the data supplied
  - Rapid EIA is for slower appraisal process
  - Comprehensive EIA is through collection of one season data only
  - None of these
50. The Chernobyl atomic accidental discharge in Russia occurred in the year
- 1956
  - 1966
  - 1976
  - 1986

## PART – II

**Each Question carries Two marks**

51. The total rate of photosynthesis in an ecosystem during a specified interval is
- Net community productivity
  - Net primary productivity
  - Gross primary productivity
  - None of these
52. The total hardness of a water sample is 500 mg/L as  $\text{CaCO}_3$ ; if the total alkalinity of the sample is 270 mg/L as  $\text{CaCO}_3$ , the temporary hardness of the water is
- 500 mg/L as  $\text{CaCO}_3$
  - 270 mg/L as  $\text{CaCO}_3$
  - 230 mg/L as  $\text{CaCO}_3$
  - None of these
53. If the diameter of the main pipe is taken less than economical diameter then
- Head loss will be high
  - Cost of the pipe will be less
  - Cost of pumping will be more
  - All of these
54. The sum of ammonia and organic nitrogen is
- Nitrate nitrogen
  - Total nitrogen
  - Kjeldahl nitrogen
  - None of these
55. If 5 m<sup>3</sup> of certain oil weighs 4000 kg then what is its specific weight
- 800
  - 0.8
  - 20000
  - None of these
56. The qualitative test for coliform group in water include
- Presumptive
  - Confirmed
  - Completed
  - All of these
57. If V is the velocity of flow in ground water and S is the slope of the hydraulic gradient line and the conditions obeying Darcy's equation, then
- $V \propto S$
  - $V \propto S^2$
  - $V \propto 1/S$
  - None of these
58. From biological viewpoint a lake has layers of
- Compensation level
  - Euphotic zone
  - Profoundal zone
  - All of these

What is the HP of the pump set if the discharge to be delivered is  $5 \times 10^{-2} \text{ m}^3/\text{s}$  and the unit weight of water is  $1000 \text{ kg/m}^3$ , the total head against which the motor has to work is 25 m and the efficiency of the pump set is 65 %

- a) 38                      b) 26                      c) 12                      d) 6.5

The coefficient of hydraulic capacity of the pipe is 110, the hydraulic mean depth of circular pipe is 0.0625 m and slope of the energy line is  $7.80 \times 10^{-3}$  then by Hazen-William's formula the flow velocity through the pipe in m/s is

- a) 1.18 m/s                      b) 11.8 m/s                      c) 0.118 m/s                      d) 0.0118 m/s

A treatment unit is 1.5 m wide, 20 m long and has a wastewater depth of 2.0 m in it. If the wastewater flow through the tank is  $0.5 \text{ m}^3/\text{s}$  then the detention time of wastewater in the tank is

- a) 0.2 minutes                      b) 2.0 minutes                      c) 20 seconds                      d) 2 hours

The food-to-microorganism ratio in activated sludge process is defined as

- a)  $F/M = S_o / \theta X$                       b)  $F/M = \theta S_o / X$                       c)  $F/M = S_o / X$                       d)  $F/M = \theta / X S_o$

In the oxidation step of nitrification, nitrogen is first oxidized to nitrite form by

- a) Nitrosomonas                      b) Nitrobacter                      c) PAOs                      d) All of these

Mercury from the industrial wastewater can be removed by

- a) Precipitation process                      b) Ion exchange process  
c) Adsorption process                      d) All of these

The chemical characterization of solid waste include

- a) Proximate and Ultimate analysis                      b) Density  
c) Moisture Content                      d) None of these

Landfill gases are composed of

- a) Methane                      b) Nitrogen                      c) Hydrogen sulfide                      d) All of these

The compaction ratio indicating densities of solid waste is given by

- a)  $r = \rho_d / \rho_c$                       b)  $r = (\rho_c / \rho_d) \times 100$                       c)  $r = \rho_c / \rho_d$                       d)  $r = (\rho_d / \rho_c) \times 100$

The plume behavior when there exists a vertical air temperature gradient between dry adiabatic and isothermal, the air being slightly unstable with some horizontal and vertical mixing occurring is a

- a) Looping plume                      b) Coning plume                      c) Lofting plume                      d) Trapping plume

The minimum size of the particulate matter that will get removed by a 100 % efficient settling chamber of 10 m length and 1.5 m height, if the viscosity of emission is  $1.7 \times 10^{-5} \text{ kg/m s}$  and horizontal velocity into the chamber is 0.3 m/s will be

- a) 5.2  $\mu\text{m}$                       b) 52  $\mu\text{m}$                       c) 520  $\mu\text{m}$                       d) None of these

70. In material balance relationship the net rate of accumulation within the control volume is equal to
- Rate of mass input across control volume
  - Rate of mass output across control volume
  - Rate of chemical reaction within control volume
  - (a) - (b) + (c) of above
71. If  $K$  is first order reaction rate constant and  $K_2$  is reaeration constant than critical Dissolved Oxygen deficit in rivers is calculated by
- $D_c = K/K_2 (L_0 e^{-kt}c)$
  - $D_c = K_2/K (L_0 e^{-kt}c)$
  - $D_c = K K_2 (L_0 e^{-kt})$
  - $D_c = K/K_2 (L_0 e^{-kx})$
72. The effluent containing chloride concentration of 4000 mg/L is discharged from a sewage treatment plant to a stream. The upstream (background) concentration of chloride is 40 mg. If the effluent flow is 200 m<sup>3</sup>/day and stream flow is 2000 m<sup>3</sup>/day what is the resulting chloride concentration in the mixed stream?
- 200 mg/L
  - 300 mg/L
  - 400 mg/L
  - 500 mg/L
73. What is the ionic strength of water containing 0.01 M of MgCl<sub>2</sub> and 0.02 M Na<sub>2</sub>SO<sub>4</sub>
- 0.09
  - 0.081
  - 0.9
  - 0.81
74. If coal is used as fuel in thermal power plants than the pollutants produced are
- Fly ash
  - Sulphur dioxide
  - Nitrogen oxides
  - All of these
75. For environmental impact prediction the model used for air environment is
- StormCAD
  - Stream I & II
  - ISCST
  - None of these