Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.TECH(OLD)/SEM-1/CH-101/2011-12

2011

ENVIRONMENT & ECOLOGY

Time Allotted : 3 Hours   Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

$$10 \times 1 = 10$$

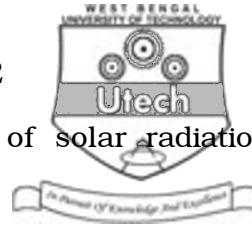   i)   The unit of the exponential growth rate constant (*r*) is

        a)   Population $^{-1}$ b)   Population / Time

        c)   Time $^{-1}$ d)   Time / Population.

    ii)   Ozone acts as a protective shield when it resides in

        a)   Mesosphere   b)   Stratosphere

        c)   Thermosphere   d)   Troposphere.

iii) The average annual solar intensity of solar radiation (Solar constant, S) is

    a) $1370 \ W/m^2$ b) $1370 \ m^2/W$

    c) $0{\cdot}31 \ W/m$ d) $0{\cdot}69 \ W^2/m.$

iv) Looping Plume appears in the atmospheric condition of

    a)   Neutral   b)   Inversion

    c)   Super adiabatic   d)   Sub adiabatic.

v) The main cause for the formation of Photochemical Smog is

    a) SO_2 b)   Hydrocarbons

    c)   NO   d) O_3 .

vi) In the following the Abiotic factor of the ecosystem is

    a)   Producers   b)   Microbes

    c)   Sunlight   d)   Consumers.

vii) In the grassland ecosystem, the second trophic level is occupied by

    a)   Primary consumers   b)   Producers

    c)   Tertiary consumers   d)   Secondary consumers.

viii) The value of BOD is always

    a) more than COD   b) less than COD

    c) same to COD   d) none of these.

ix) Eutrophication in the surface waters occur due to the presence of

    a) organic salts   b) nutrients

    c) inorganic salts   d) arsenic.

x) The tertiary treatment of water is done to remove excess

    a) suspended solids

    b) colloidal particles

    c) microbes

    d) nitrogen & phosphorous.

xi) 'Keratosis' is disease caused by the presence of

    a) Arsenic

    b) Mercury

    c) Lead

    d) Phytoplankton in water bodies.

xii) If the intensity of a sound is 100 times more than the reference intensity, then its Decibel value will be

a) 10 dB

b) 30 dB

c) 40 dB

d) 20 dB.

xiii) The value of Wet adiabatic lapse rate is

a) $15°C/km$

b) $6°C/km$

c) $10°C/km$

d) $9·8°C/km$.

xiv) Pollutant that affects the oxygen transport in blood is

a) CO_2

b) SO_2

c) CO

d) Hydrocarbons.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2. a) What is the difference between Resource and Reserve ?

   b) What are volatile organic chemicals ($VOC's$) ? Briefly discuss their characteristic features with example.

   2 + 3

3. a) What is 'Air Quality Standard' and 'Emission Standard' ?

   b) Why is dry Adiabatic lapse rate greater han wet Adiabatic lapse rate ?   2 + 3

4.   a)   How would you broadly divide the major regions of the atomosphere ? State their respective altitudes and temperature.

   b)   Discuss the Ion-Exchange method for softening the hard water.   2 + 3

5.   a)   What are the ill effects of noise pollution ?

   b)   Calculate the intensity of a 50 dB sound.

   (given reference intenstiy = 10^{-12} W/m^2).   2 + 3

6.   a)   A sample of ground water at pH 10.0 has 32 mg/L of CO_3^{-2} and 56 mg/L of HCO_3^{-}. Find the alkalinity as $CaCO_3$.

   b)   Name six important criteria pollutants. Why are they called so ?   3 + 2

GROUP – C

### (Long Answer Type Questions)

Answer any *three* of the following.   3 × 15 = 45

7.   a)   Calculate the average temperature of the earth considering the earth to be a perfect black body.

   b)   Discuss the role of CFCs on ozone layer depletion.

   c)   Distinguish between 'Confined' and 'Unconfined' aquifers.

   d)   Write down the Phosphorous / Phosphate cycle and explain with a diagram.   5 + 4 + 3 + 3

8. a) Derive and calculate the value of Dry Adiabatic lapse rate (Γ_d) and show that its value is $9 \cdot 8°C/km$.

   b) It took about 300 yr. for the world's population to increase from $0 \cdot 5$ billion to $4 \cdot 0$ billion. If we assume exponential growth at constant rate over that period of time, what would that growth rate be ?

   c) What do you understand by the term "Green House Effect" What are the consequences of this effect ?

   d) What do you mean by the term 'Ecology' and 'Ecosystem' ?

9. a) Write a note on Mercury and Arsenic pollution of water mentioning probable causes of such pollution.

   b) Discuss how 5-day BOD test is performed.

   c) The dilution factor 'P' for an unseeded mixture of waste water is $0 \cdot 030$. The DO of the mixture is initially $9 \cdot 0$ mg/L and after 5 days it has dropped to $3 \cdot 0$ mg/L. The reaction rate constant 'K' has been found to be $0 \cdot 22$ day^{-1} .

      i) What is the five-day BOD of the waste ?

      ii) What would be the ultimate carbonaceous BOD ?

   d) What is Ventilation coefficient ? What is its significance ? $5 + 3 + 5 + 2$
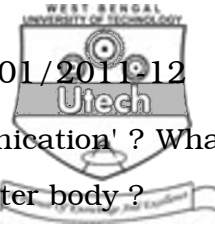
10. a) What do you mean by the term 'Eutrophication' ? What are the major sources of nutrients in water body ?

b) Describe the Activated Sludge method of raw water treatment. What are the advantages and disadvantages of such method ?

c) Diagrammatically explain Looping Plume.

d) What is Darcy's law ? What do you mean by the term 'Hydraulic gradient' ? 5 + 6 + 2 + 2

11. Write brief notes on any *three* of the following : 3 × 5

a) Global warming

b) Trickling filter

c) Hardness of water

d) Electrostatic precipitator

e) Hydrological cycle

f) Sound Intensity Level (SIL).

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