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10CV71

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016

Environmental Engineering – II

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Assume suitable missing data if any.

PART – A

1 a. Explain briefly the important features of the different "system of sewerage". Also, state their merits and demerits. **(12 Marks)**

b. Differentiate between the following
i) Sullage and sewage
ii) Raw sewage and septic swage
iii) Dry weather flow and wet weather flow
iv) Lateral sewer and outfall sewer. **(08 Marks)**

2 a. With a neat sketch explain i) The objectives, ii) Location, iii) Details of a manhole. Bring out the functions of a manhole. **(10 Marks)**

b. Design a circular sewer to serve a Residential suburb of a city with the following data.
i) Area of suburb = 50 hectanes
ii) Population = 6000 persons
iii) Average rate of water supply = 200 ℓpcd
iv) Subtraction allowance = 20%
v) Critical design rainfall intensity = 40 mm/hr
vi) Average available ground slope 1 in 1000
vii) Co – efficient of runoff = 0.45
viii) Manning's N = 0.012
Maximum flow in the sewerage system may be taken as three times the average flow. **(10 Marks)**

3 a. Explain the terms BOD and COD and their importance in wastewater treatment. **(04 Marks)**

b. Deduce an expression for determining BOD at any time. **(08 Marks)**

c. The following observations were made on a 5% dilution of sample of sewage
D.O of blank = 3.3 mg/ℓ
D.O of diluted sample after 5 days incubation = 0.89 mg/lit.
D.O of origin sample = 0.55 mg/ℓ.
Calculate the ultimate B.O.D of sample. Assume K_D = 0.1/day. **(08 Marks)**

4 a. Draw a flow diagram from an outfall to the disposal into a river valley after complete treatment for a proposed sanitary project for a town. Indicate the purpose of each unit adopted during the process treatment. **(12 Marks)**

b. What are the important salient properties of "Activated sludge process"? Explain the process involved in treating domestic sewage. **(08 Marks)**

PART – B

5 a. Explain briefly the dilution method of disposal of sewage. What are the factors which influence the choice of the method to be adopted? **(08 Marks)**

b. Discuss in detail the process deoxygenation and reoxygenation with respect to self purification of natural waters with a neat sketch. **(12 Marks)**

6 a. What do you understand by the term "Low cost waste treatment"? **(04 Marks)**

b. Explain with a neat sketch the principle and process working of an "Oxidation pond". **(06 Marks)**

c. Design an oxidation pond to treat sewage in a tropical country, from a colony of 10,000 persons. The B.O.D of the sewage is 300mg/ℓ and flow is 120 lpcd 90% of water supplied is collected as sewage. Check the detention time. Sketch the details of the oxidation pond. **(10 Marks)**

7 a. What is sludge gas? What is its typical composition? What are the uses of sludge gas? **(04 Marks)**

b. Explain briefly the different stages of sludge digestion process in a "Digestor". With a neat sketch explain the constructional details of sludge digestion tank. **(08 Marks)**

c. Design sludge digestion tank for one lakh population. The sludge content per capita per day is 0.07kg. The moisture of sludge is 94%. The specific gravity of wet sludge is 1.02 and 3.5% of fresh sludge is being mixed with digested sludge. **(08 Marks)**

8 Write short notes on the following:

a) Sewage farming
b) Testing of a sewer line
c) Sludge bulking and sludge volume index
d) Oxidation ditch. **(20 Marks)**

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10CV72

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016

Design of Steel Structures

Time: 3 hrs. Max. Marks:100

Note: 1. ***Answer FIVE full questions, selecting at least TWO questions from each part.***

2. ***Use of IS 800-2007 SP : 6 (1) – 1964 or steel table is permitted.***

3. ***Assume steel of Fe – 410 and Bolts of Class 4.6 if not specified.***

PART – A

1 a. Explain difference between working stress design and limit state design of steel structures. **(08 Marks)**

b. Explain the advantages and disadvantages of steel structures. **(06 Marks)**

c. Explain briefly about classification of cross section and their characteristics with the aid of moment rotation relationship. **(06 Marks)**

2 a. With sketches, explain the different failures of bolted connections. **(06 Marks)**

b. Design a bolted connection for a lap joint of plate thickness of 10mm and 12mm to carry a service load of 100kN. Use M_{16} 4.6 grade bolt. Give the details with sketch (Assume the bolts as fully threaded). **(14 Marks)**

3 a. Discuss the main two types of weld commonly used in structural work with sketches. **(06 Marks)**

b. Calculate the factored load that can be supported by bracket connection shown in Fig. Q3 (b) Take size of weld as 6mm. **(14 Marks)**

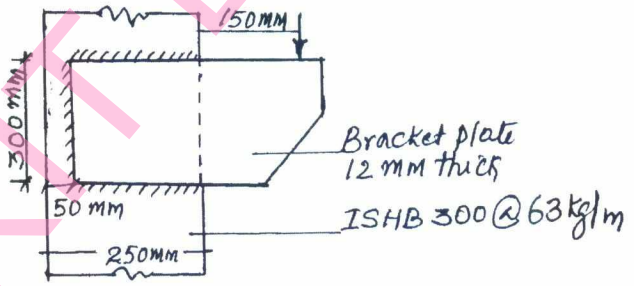

Fig. Q3 (b)

4 a. Explain the terms
i) Plastic moment ii) Plastic hinge iii) Shape factor iv) Collapse mechanism. **(06 Marks)**

b. Analyze the continuous beam shown in Fig Q4 (b). Calculate maximum plastic moment. Take load factor as 1.5. **(14 Marks)**

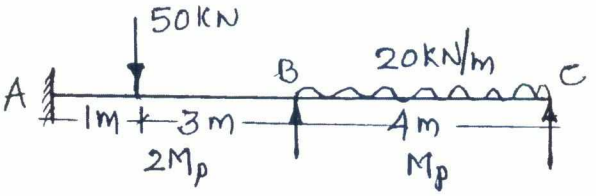

Fig. Q4 (b)

PART – B

5 a. What are lug angles? Explain design principle of lug angle. **(06 Marks)**

b. Designs a single angle section to carry a service tensile load of 120kN. Use M_{20} 4.6 grade bolt (Fully threaded). **(14 Marks)**

6 Design a built up column consisting of two channel section placed back to back carrying an axial factored load of 1400kN. Effective length of column is 5m and also designs lacing, sketch the details. **(20 Marks)**

7 a. Design a slab base of a column ISHB 300@ 58.8 kg/m, subjected to carry a working load of 1500kN. The grade of concrete for pedestal is M_{20} and SBC of soil is 180kN/m^2. Design also length of weld required. **(08 Marks)**

b. Design a gusseted base for a column to carry an axial factored load of 3000kN. The column is ISHB 400@77.4kg/m, with two cover plates of 250×20mm on either side. Use M_{22} property class 5.6 bolts. Sketch the base showing the detail of bolts. **(12 Marks)**

8 a. Explain web crippling and web buckling in flexural member. **(06 Marks)**

b. A roof of a hall measuring 6m×15m consists of 120mm thick R.C slab supporting on steel I section spaced at 3mc/c. The hall is having wall of 300mm thickness all round. The finishing load on the roof is 1.5kN/m^2 and super imposed load is 2kN/m^2. Design the steel beam with all necessary checks (Web crippling and buckling need not be done). **(14 Marks)**

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10CV74

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Design of Prestressed Concrete Structures

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Use of IS 1343-1980 is permitted.

PART – A

1 a. Define prestressed concrete. State advantages as over reinforced concrete. **(06 Marks)**

b. Distinguish between pre-tensioning and post-tensioning. **(08 Marks)**

c. Explain Magnel – Blaton post tensioning system with a neat sketch. **(06 Marks)**

2 a. Explain load balancing concept in a prestressed concrete members. **(04 Marks)**

b. A simply supported concrete of rectangular cross section 400 × 600 mm is loaded with a total UDL of 60 kN/m over a span of 6 m. Draw the distribution of stress at mid span. If the prestressing force of 1920 kN and the parabolic profile of the tendon has an eccentricity of 100 mm at ends and 200 mm at mid span. **(16 Marks)**

3 A prestressed concrete beam of inverted T-beam as shown in Fig.Q3 and is simply supported over a span of 16 m. The beam is post-tensioned with a 3-Freyssinet cables, each containing 12 wires of 7 mm dia placed as shown at the mid span. If the initial prestress is 1000 N/mm^2, calculate maximum uniformly distributed load if the maximum compressive stress in concrete is limited to 14 N/mm^2 and tensile stress is limited to 1 N/mm^2. Assume loss of prestress as 15%. **(20 Marks)**

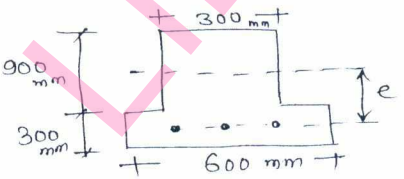

Fig.Q3

4 a. List the various losses in pre-tensioned and post tensioned beams. **(04 Marks)**

b. A post tensioned prestress concrete beam of 30 m span is subjected to a prestress force of 250 kN at 28 days strength. The profile of cable is parabolic with maximum eccentricity of 200 mm at mid span. Determine the loss of prestress and has a cross section of 500mm × 800mm deep beam is prestressed with 9 cables each consists of 12 wires of 5 mm dia. Take $E_s = 2.1\times10^5$ N/mm^2 and $E_c = 3.5\times10^4$ N/mm^2. The cable is tensioned at time. **(16 Marks)**

PART – B

5 a. Explain the load deflection characteristics of typical prestressed concrete beam under flexure with a diagram. **(06 Marks)**

b. A rectangular concrete beam of cross-section 150 mm × 300 mm deep is simply supported over a span of 8 m and is prestressed by means of a symmetric parabolic cable at a distance of 75 mm from the bottom of the beam at mid span and 125 mm from the top of the beam at support section. If the force in the cable is 350 kN and the modulus of elasticity of concrete is 38 kN/mm^2, calculate (i) The deflection at mid span when the beam is supported its own weight and (ii) the concentrated load which must be applied at mid span to restore it to the level of supports. **(14 Marks)**

6 a. Explain the mechanism of shear failure in PSC beams. **(06 Marks)**

b. A pre-stressed T-section has a flange width of 300 mm and the thickness of the flange is 200 mm. The rib is 150 mm wide by 350 mm deep. The effective depth of the cross section is 500 mm. Given $A_p = 200$ mm^2, $f_k = 50$ N/mm^2 and $f_p = 1600$ N/mm^2. Determine the flexural strength of the section. **(14 Marks)**

7 a. What is transmission length? List the factors influencing transmission length. **(06 Marks)**

b. A pretensioned beam is prestressed using 5 mm diameter wires with an initial stress of 80 percent of the ultimate tensile strength of steel, $f_{pu} = 1600$ N/mm^2. The cube strength of concrete at transfer is 30 N/mm^2. (i) Calculate the transmission length (ii) Compute the bond stress at 1/4 and 1/2 the transmission length from the end and (iii) Calculate the overall average bond stress. **(14 Marks)**

8 a. Explain end zone reinforcements. **(04 Marks)**

b. A pre-tensioned beam of 8 m span has a symmetrical I-section. The flanges are 200 mm wide and 60 mm thick. The web thickness is 80 mm and the overall depth of girder is 400 mm. The member is prestressed by 8 wires of 5 mm diameter located on the tension side such that the effective eccentricity is 91 mm. The initial stress in the wires is 1280 N/mm^2 and the cube strength of concrete at transfer is 42 N/mm^2.

(i) Determine the maximum vertical tensile stress developed in the transfer zone and

(ii) Design suitable mild steel reinforcement assuming the permissible stress in steel as 140 N/mm^2. **(16 Marks)**

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10CV755

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Highway Geometric Design

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Assume any missing data suitably as per IRC standards.

PART – A

1 a. Write a note on (i) Design speed (ii) Design vehicle. Also list the various specifications for each as per IRC standards. **(10 Marks)**

b. Explain the various objects of highway geometric design. List the various geometric elements to be considered in the highway geometric design. **(10 Marks)**

2 a. Explain at least two objectives providing (i) Camber (ii) Medians (iii) Right of way (iii) Kerbs. **(08 Marks)**

b. Draw the typical cross section of the following with relevant dimensions:
i) Two lane city road in Built up area. ii) Divided highway in urban area. **(08 Marks)**

c. In a road test for measuring skid resistance, using skid resistance equipment, the timer indicating 5 seconds of brake application and the braking distance indicated by the colour spray was measured as 35.0 m before the vehicle was brought to stop. What is the average resistance of the pavement surface? **(04 Marks)**

3 a. What is sight distance? Explain briefly the three important sight distance situations considered in highway Geometric Design. **(08 Marks)**

b. Explain PIEV theory with a neat sketch. **(04 Marks)**

c. The design speed on a two way traffic road is 75 kmph. The rate of acceleration of the fast moving vehicle is 0.95 $m/sec^2/sec$. The difference in speed between overtaking and overtaken vehicles is 25 kmph. Calculate (i) Safe OSD (ii) Mention the minimum and desirable length of OTZ (iii) Draw the overtaking zone. **(08 Marks)**

4 a. Calculate the setback distance on a national highway having horizontal curve of radius 300 m and length 180 m. Assume speed as 80 kmph and coefficient of friction as 0.35. **(08 Marks)**

b. Derive the expression for super elevation on a horizontal curve. **(08 Marks)**

c. Calculate the extra widening required on a single lane one way road having a horizontal curve of radius 80m, with a wheel base of 6.1 m. **(04 Marks)**

PART – B

5 a. Differentiate between Summit curve and valley curve. **(04 Marks)**

b. Derive an equation for length of valley curve for
(i) Comfort condition
(ii) Headlight sight distance when i) L > SSD , ii) L < SSD. **(08 Marks)**

c. A summit curve is to be designed for a speed of 80 kmph, when two grades +1 in 60 and –1 in 40 meets on a curve such that SSD and OSD of 150 m and 600 m respectively. Due to site conditions, the length of summit curve is restricted to less than 500 m. Find the length of summit curve to fulfill both the safepassing sight distance and safe stopping sight distance requirements. **(08 Marks)**

6 a. Write a note on : (i) Gap in medians at junctions (ii) Channelizing Island. **(10 Marks)**

b. Briefly explain the channelized and unchannelized intersections, their advantages and disadvantages. **(10 Marks)**

7 a. Briefly explain the design steps involved in the rotary intersection along with relevant formulae employed. **(10 Marks)**

b. Draw a neat sketch of

(i) Diamond interchange (ii) Half clover leaf and explain any TWO advantages of each. **(10 Marks)**

8 a. Explain the importance of highway drainage. **(06 Marks)**

b. Explain the design procedure of filter material used in subsurface drain. **(08 Marks)**

c. A longitudinal channel with a trapezoidal cross section is to be constructed in a cut section. The longitudinal slope is 1 in 2500, soil is clay with Manning's coefficient as 0.024. Take discharge of 3 m^3/sec, and velocity of flow as 0.6 m/s. **(06 Marks)**

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10CV756

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Open Channel Hydraulics

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Differentiate between : i) Prismatic channel and Non prismatic channels
ii) Energy coefficient and momentum coefficient. **(10 Marks)**

b. In a measurement of discharge in a river, it was found that the depth increases at a rate of 0.5m per hour. If the discharge at that section is $15m^2/s$ and the surface width of river is 15m. Estimate the discharges at a section 1.2km upstream. **(10 Marks)**

2 a. Derive Chezy's formula and establish relation between Chezy's and Manning's constant. **(10 Marks)**

b. A trapezoidal channel 1.8m wide at the bottom and having slope 1:1 is laid on a slope of 0.0016. If the depth of the water is 1.5m, find the rate of uniform flow. Assume N = 0.014. **(10 Marks)**

3 a. Show that for critical flow $\frac{Q^2}{g} = \frac{A^3}{T}$. **(10 Marks)**

b. Calculate critical depth Y_c and corresponding specific energy for the following different shapes of channel when $Q = 8.5m^3/s$.
i) Rectangular channel B = 2.5m ii) Triangular channel with side shape = 1.5H : 1V, i.e. Z = 1.5. **(10 Marks)**

4 a. Derive dynamic equation for gradually varied flow. **(10 Marks)**

b. A rectangular channel of 5m wide carries water at depth 1.5m, $S_b = 10^{-4}$, n = 0.016 and ends in a canal drop. The depth upstream at some upstream point is 1.4m. Find the type of profile. **(10 Marks)**

PART – B

5 a. What are the types of channel bottom shapes? Explain. **(08 Marks)**

b. A rectangular channel 7.5m wide has a uniform depth of flow 2m and has a bed slope of 1 in 3000. If the water surface at a section is raised by 0.75m due to weir constructed at the downstream end of the channel at the beginning. Find the slope of water surface with respect to horizontal at this section. Assume n = 0.02 (Manning's). **(12 Marks)**

6 a. Explain Bruse's method of integration of the varied flow equation. **(08 Marks)**

b. A rectangular channel of base width 7m is lined with a slope of 1 in 1000. It carries a discharge of 35m3/s. The channel terminates in a free overfall. Compute the length of flow profile from the free overfall to a print where the depth is 0.95 times the normal depth. Use standard step method. Take n = 0.025. **(12 Marks)**

7 a. Establish a relation between the alternate depths for a horizontal rectangular open channel

$$Y_c^3 = \frac{2y_1^2\ y_2^2}{(y_1 + y_2)}$$ **(10 Marks)**

b. Water flows from an under sluice in to a very wide rectangular channel. The channel has a bed slope of 1 in 1000. The sluice is regulated to discharge $6m^3/s/m$ width of channel. The depth of vena contract being 0.5m. Will a hydraulic jump from? If so, determine the length of the jump. **(10 Marks)**

8 a. Explain with sketches different types of jumps. **(10 Marks)**

b. Write short notes on :

i) Stilling basin.

ii) Aeration of nappe. **(10 Marks)**

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10CV757

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Solid Waste Management

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define Land Pollution. What are the effects and control methods of Land Pollution? **(10 Marks)**

b. List out different sources of Municipal Solid Waste. Explain briefly. **(10 Marks)**

2 a. Explain with the aid of neat sketches, Hauled container system and stationary container system of collection of Municipal wastes. **(10 Marks)**

b. Describe Route Optimization process. **(10 Marks)**

3 a. Brief out what do you mean by Mechanical volume reduction and Chemical volume reduction. **(10 Marks)**

b. Give list of component separation techniques. Explain them. **(10 Marks)**

4 a. Define Incineration. Sketch and explain a typical Municipal Incinerator. **(10 Marks)**

b. What are 3T's of Incineration process? Explain. **(05 Marks)**

c. Explain Pyrolysis process with applicable to incineration process for Municipal solid waste. **(05 Marks)**

PART – B

5 a. Describe different design components which are to be considered for Aerobic composting process. **(10 Marks)**

b. With the aid of neat sketch, explain the Bangalore Process of composting. **(10 Marks)**

6 a. Explain the factors that govern the selection of site for Sanitary Land filling. **(10 Marks)**

b. What are the sanitary land filling methods? Explain briefly. **(10 Marks)**

7 a. Highlight the Open dumping method of disposing Municipal Solid waste with its advantages and disadvantages. **(10 Marks)**

b. Determine the land fill area required for a municipal solid waste management system with a population 50000, given that :
   i) Solid waste generation = 350 gm/person/day.
   ii) Compacted density of landfill = 504 kg/m^3.
   iii) Average depth of compacted solid wastes = 3m. **(10 Marks)**

8 a. Explain briefly the Biomedical waste classification and disposal. **(10 Marks)**

b. Write a short note on Plastic waste, its environmental significance and reuse. **(10 Marks)**

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10CV763

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Pavement Materials and Construction

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Briefly explain the basic classification of aggregates. **(05 Marks)**
b. List the various tests to be conducted on road aggregates and indicate the permissible value of the aggregate to be used in pavement construction. **(10 Marks)**
c. Write a note on aggregate blending to meet the specified gradation. **(05 Marks)**

2 a. List the various differences between Bitumen and Tar. **(06 Marks)**
b. What are the tests conducted on Bitumen? Mention the importance of each. **(08 Marks)**
c. Explain the mechanism of stripping of bituminous binder and the methods of improving adhesion. **(06 Marks)**

3 a. What are Emulsions? Briefly explain different types of emulsions. **(06 Marks)**
b. Explain the mechanism of adhesion failure. **(06 Marks)**
c. Explain the static immersion test, used to evaluate adhesion failure of bitumen in the presence of water. **(08 Marks)**

4 a. Briefly discuss the desirable properties of bituminous mixes. **(08 Marks)**
b. Explain the Marshall method of bituminous mix design. **(12 Marks)**

PART – B

5 a. Explain with sketches, the working principle of Power shovel and Drag line. **(08 Marks)**
b. Discuss the advantages and disadvantages of a shear foot roller over other types of rollers. **(06 Marks)**
c. Briefly explain the various factors affecting the selection of Road construction equipments. **(06 Marks)**

6 a. Enumerate the steps in the construction of subgrade. What are the quality control tests at the lab and in the field? **(10 Marks)**
b. Enumerate the steps in the formation of an embankment. **(10 Marks)**

7 a. Explain the suitability of : **(10 Marks)**
i) WBM ii) Bituminous bound Macadam iii) Bituminous concrete pavements.
b. Mention the specification and list the steps in the construction of bituminous concrete pavement. **(10 Marks)**

8 a. With neat sketches, show the details of following types of joints in rigid pavements :
i) Expansion joint ii) Construction joint iii) Longitudinal joint. **(10 Marks)**
b. Discuss the specification of materials for cement concrete pavement. Enumerate the steps involved in the construction of CC pavement. **(10 Marks)**

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10CV765

Seventh Semester B.E. Degree Examination, Dec.2015/Jan.2016
Air Pollution and Control

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define Air pollution. Explain primary and secondary air pollutants with examples. **(10 Marks)**

b. Explain the effects of photochemical smog on human beings and plants. **(10 Marks)**

2 a. Briefly explain the effects of air pollution on :
i) Human health ii) Plants iii) Animals iv) Materials. **(10 Marks)**

b. Discuss the following cases of air pollution episodes :
i) Bhopal Gas Tragedy ii) Los Angeles Smog. **(10 Marks)**

3 a. Explain with neat sketches, how different atmospheric conditions give rise to different kinds of plumes. **(10 Marks)**

b. Explain the terms :
i) Environmental Lapse Rate (ELR) ii) Adiabatic Lapse Rate (ALR)
iii) Wind Rose (WR) iv) Inversions. **(10 Marks)**

4 a. List the factors that should be taken into consideration while selecting a site for an industry from the point of minimizing air pollution. **(10 Marks)**

b. Explain different methods of gaseous air pollutants sampling from the ambient atmosphere. **(10 Marks)**

PART – B

5 a. Explain with neat sketches the principle and working of the following :
i) Cyclone separator ii) Electrostatic precipitators. **(10 Marks)**

b. Enumerate the various analytical methods available for monitoring air pollution. **(10 Marks)**

6 a. Explain briefly the principal emission from gasoline driven and diesel driven vehicles. **(10 Marks)**

b. What are the various approaches to minimize exhaust emissions? Explain. **(10 Marks)**

7 a. What is Acid rain? What are the causes for acid rain? What are the effects of acid rain on vegetation? **(10 Marks)**

b. Describe the phenomenon of "green house effect", due to carbon dioxide. **(10 Marks)**

8 Write short notes on any four of the following :
a. Water quality standards.
b. Ozone layer depletion.
c. Adsorption by solids.
d. Stack gas sampling.
e. Environmental policy. **(20 Marks)**

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