Total No. of printed pages = 4

CE 181605

Roll No. of candidate | | | | | | | | | | |

2022

B.Tech. 6th Semester End-Term Examination

GEOTECHNICAL ENGINEERING – II

(New Regulation & New Syllabus)

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following MCQ (10 × 1 = 10)

(i) The angle of internal friction of a dry cohesionless soil is 30°. The coefficient of earth pressure at rest condition is

(a) 0.43
(b) 0.33
(c) 0.59
(d) 0.5

(ii) A strip footing is founded at a depth of 1.2m below the surface of a deep stratum of soft saturated clay having unit weight of 19.5kN/m^3 and unconfined compression strength of 50 kN/m^2. The ultimate bearing capacity according to Terzaghi

(a) 208.65 kN/m^2
(b) 350.22 kN/m^2
(c) 165.9 kN/m^2
(d) 198.4 kN/m^2

(iii) The maximum permissible total settlement recommended by IS: 1904 (1986) for a footing resting on plastic clay is

(a) 40mm
(b) 50mm
(c) 75mm
(d) 70mm

[Turn over

(iv) According to Coulomb's wedge theory, the active earth pressure slides the wedge

(a) down and outward on a slip surface

(b) up and inward on a slip surface

(c) horizontal upward and parallel to base

(d) horizontal upward and parallel to base

(v) When the soil mass is in active Rankine state, two sets of failure planes develop, each inclined at an angle θ to the horizontal. The value θ of is

(a) $65° + \frac{\phi}{2}$ (b) $65° - \frac{\phi}{2}$

(c) $45° - \frac{\phi}{2}$ (d) $45° + \frac{\phi}{2}$

(vi) A pile of 0.50 diameter and length 10m is embedded in a deposit of clay. The undrained strength parameters of the clay are cohesion = 60 $kN/m2$ and the angle of internal friction is = 0°. The skin friction capacity (kN) of the pile for an adhesion factor of 0.6 is

(a) 671 (b) 565.2

(c) 283 (d) 106

(vii) When a retaining wall moves away from the back fill, the pressure exerted on the wall at the instant of full shear strength mobilization is termed as

(a) Passive earth pressure (b) Pore pressure

(c) Active earth pressure (d) None

(viii) Local shear failure will occur in soil when the ϕ value is less than or equal to

(a) 29°

(b) 36°

(c) 40°

(d) 42°

(ix) A test plate 30cm square, settles by 10mm under a load of 9kN in a sand soil. A footing 1.5 m × 1.5m and subjected to a load of 225kN shall settle by

(a) 108 mm

(b) 50 mm

(c) 53 mm

(d) 60 mm

(x) The value of reduction factors Rw1 and Rw2 when the water table is at the base of the footing are

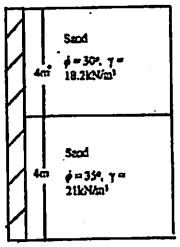
(a) 1.0 and 1.0

(b) 0.5 and 1.0

(c) 1.0 and 0.5

(d) 0.5 and 0.5

2. (a) For the smooth retaining wall shown in the figure, make a sketch of the distribution of active earth pressure on the wall giving the principal values. Compute the total active resultant thrust per metre length of the wall. (5)



(b) Differentiate between Coulomb's earth pressure theory and Rankine's earth pressure theory. (4)

(c) A retaining wall 6m high, has a smooth vertical back. The backfill surface is horizontal and in level with the top of the wall. The unit weight of the backfill soil is $18kN/m^3$, its angle of shearing resistance, ϕ is 30° and the cohesion value, c is $35kN/m^2$. Determine the total active thrust per unit length of the retaining wall and its point of application. (6)

3. (a) A rectangular footing 2m × 3m is placed at a depth of 2m below the ground surface. The properties of the foundation soil are c = $25kN/m^2$, ϕ = 36°, $\gamma = 18kN/m^3$. (8)

For $\phi = 36°$, $N_c = 50.6$, $N_q = 37.8$, $N_\gamma = 56.5$.

The load on the footing is concentric but it acts at an angle of 15° to the vertical.

Determine by IS 6403 (1981) recommendations, the net safe load that can be supported by the footing with a F.O.S. of 3 with respect to shear failure.

(b) A strip footing 2m wide rests on the surface of a dry cohesionless soil having $\phi = 17°$ and $\gamma = 181<N/m^3$. If the flood causes the water table to rise temporarily to the surface, what percentage of ultimate bearing capacity is reduced? Take $N_q = 5$, $N_\gamma = 4$. (2)

(c) Loose to medium sand extends from ground surface upto a considerable depth. The water table is at depth of 3m from the ground surface. The N-value from standard penetration test at a depth of 5m is 18. Unit weight above the water table is $18kN/m^3$ and saturated unit weight below the water table is $20kN/m^3$. Determine the corrected N- value of the soil. (5)

4. (a) A rectangular footing of size 2.5m × 3.5m is placed at a depth of 1m on a stiff saturated clay. The load acting on it is vertical but it is eccentric in both the x and y direction. The eccentricity is 0.2m in each directions. Compute the safe load on the footing if the factor of safety is three and the settlement is negligible. Take cohesion $c_u = 105KN/m^2$, $\phi_u = 0°$ and $\gamma = 17.8kN/m^3$. Use I.S. code procedure. (6)

(b) Elaborate with a neat sketch the procedure of conducting the seismic refraction test. (6)

(c) What is a bore log? Explain it with the help of a neat sketch. (3)

5. (a) A pile group having nine piles were installed in a square pattern in a homogeneous clay deposit The unconfined compressive strength of the clay deposit is $140kN/m^2$. The piles are 12m long and 400mm in diameter. The spacing between the piles are 900mm. Compute (3+4+2=9)

(i) The load carrying capacity of a single pile.

(ii) The load carrying capacity of the group pile.

(iii) The efficiency of the pile group.

Assume adhesion factor = 0.9.

(b) Elaborate on the term negative skin friction. How can negative skin friction be determined for a pile group passing through a layer of clay of depth H which is susceptible to negative skin friction? (2+4=6)

6. (a) The results of a pile load test are given below. (3+6=9)

Load (kN)	Penetration (mm)
0	0
300	4.5
550	5.5
800	9.5
1050	14.5
1300	21.3
1550	30.0

The load test was carried out on a 300mm diameter pile having length of 10m. Draw the load settlement plot and estimate the allowable load of the pile as per Indian standard code of practice.

(b) Slope stability analysis by the method of slices for a 40° slope on the critical slip plane gave the following results: (4)

Sum of the normal forces = 350kN; Sum of tangential forces = 200kN

Sum of neutral forces = 60kN; Effective angle of internal friction = 35°

Effective cohesion = $25kN/m^2$; Length of failure surface = 18m

Calculate the factor of safety with respect to shear strength.

(c) Define the term stability number S_n. (2)

7. (a) An infinite slope in a c - ϕ soil is inclined at 12° to the horizontal. The water table is at the surface and seepage is parallel to the slope. c = $10kN/m^2$, ϕ = 25° and γ_{sat} = $20kN/m^3$. If a plane slip has developed at a depth of 5m, determine the factor of safety of the slope. (7)

(b) What are the probable types of failure of a slope? (4)

(c) Elaborate on the significance of the term Seat of settlement of a shallow foundation. (4)

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2022

B.Tech. 6th Semester End-Term Examination

STRUCTURAL DESIGN — II

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Use of IS:800-2007 allowed : Assume any missing data

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)

(i) The Modulus of elasticity of steel E is

(a) 2.0×10^4 N/mm^2

(b) 2.0×10^5 N/mm^2

(c) 2.2×10^5 N/mm^2

(d) 2.5×10^5 N/mm^2

(ii) If the angle between the fusion faces between 60° and 90°, then ratio of throat thickness to effective throat thickness would be

(a) 0.70

(b) 1.45

(c) 0.65

(d) 1.25

(iii) Permissible bending stress in compression for laterally supported beams for Plastic and Compact Section shall not exceed

(a) 0.60fy

(b) 0.66fy

(c) 0.75fy

(d) 0.45fy

[Turn over

(iv) Cross-sections, which can develop plastic moment of resistance, but have inadequate plastic hinge rotation capacity for formation of plastic mechanism, due to local buckling are

(a) Class 1 - Plastic Section

(b) Class 2 - Compact Section

(c) Class 3 - Semi Compact Section

(d) Class 2 - Compact Section

(v) The Maximum Slenderness Ratio of a member carrying compressive loads resulting from dead loads and imposed loads

(a) 250

(b) 350

(c) 180

(d) None of the above

(vi) The effective length of prismatic compression members whose unsupported length is L and both the ends are retrained against rotation and translation is given by

(a) 0.60L

(b) 0.55L

(c) 0.90L

(d) 0.65L

(vii) The distance between centre of fasteners shall not be less than

(a) 3.0 times the nominal diameter of the fastener

(b) 2.5 times the nominal diameter of the fastener

(c) 5.0 times the nominal diameter of the fastener

(d) 1.5 times the nominal diameter of the fastener

(viii) In the case of welded lap joints, the minimum lap should not be less than

(a) three times the thickness of the thinner part joined or 40 mm, whichever is more

(b) four times the thickness of the thinner part joined or 50 mm, whichever is more

(c) four times the thickness of the thinner part joined or 40 mm, whichever is more

(d) two times the thickness of the thinner part joined or 25 mm, whichever is more

(ix) In practice the actual length of weld is made of the

(a) effective length shown in drawing plus 1.5 times the weld size, but not less than THREE times the size of the weld

(b) effective length shown in drawing plus 2 times the weld size, but not less than THREE times the size of the weld

(c) effective length shown in drawing plus 2.5 times the weld size, but not less than FOUR times the size of the weld

(d) effective length shown in drawing plus 2 times the weld size, but not less than FOUR times the size of the weld

(x) The minimum edge and end distances from the centre of any hole to the nearest edge of a plate shall not be less than

(a) 1.5 times the hole diameter in case of rolled, machine-flame cut, sawn and planed edges.

(b) 1.7 times the hole diameter in case of rolled, machine-flame cut, sawn and planed edges

(c) 2.0 times the hole diameter in case of rolled, machine flame cut, sawn and planed edges

(d) None of the above

2. (a) Plastic Section Modulus is different from Elastic Section modulus. Briefly explain. (5)

(b) Two plates of thickness 16 mm and 12 mm are in a lap joint and are to be designed to transfer a tensile load of 750 kN. If the 16 mm plate is 300 mm wide and the 12 mm plate is 250 mm wide, with the 12 mm plate resting on 16 mm plate, Design the joint with welding of appropriate size and length. $f_y = 250\,Mpa,\ f_u = 410 Mpa$. (10)

3. (a) Shape Factor defines the plastic moment capacity of a section. Briefly Explain. (5)

(b) ISA 100 × 100 × 10 is used as a Tie member in a Truss. The section is connected to a gusset plate of thickness 12 mm by means of four bolts, which are arranged in single line with edge distance of 40 mm and pitch @ 50 mm c/c. The bolt dia. is 16 mm. Calculate the capacity of the member. (10)

4. (a) Welding has both advantages and disadvantages over bolting. Explain briefly. (5)

(b) Calculate the maximum value of udl w that can be safely applied on the entire span on beam of span 4.45 meter. The beam is simply supported at both the ends and laterally retrained along the entire span. The section is ISMB 450 and the load is applied at the top flange.

$f_y = 250\,Mpa,\ f_u = 410 Mpa$. (10)

5. (a) What is a Fillet joint? Briefly explain with illustration from IS code.. (5)

(b) A double angle discontinuous strut consists of two ISA 90 × 90 × 10 connected to either side of a 12 mm thick gusset plate with three 12 mm dia. bolts. The unsupported length of the strut is 2.65 meter. Calculate the load carrying of the section. (10)

6. (a) What do you understand by class of section based on rotation capacity without local buckling as given in IS code? Briefly Explain. (5)

(b) A beam of span 4.5 meter is simply supported at both the ends and laterally un-retrained except at the end. The super imposed load on the beam is 20 kN/m. The load is applied at the top flange. Design the beam considering $f_y = 250\,Mpa$, $f_u = 410 Mpa$. (10)

7. (a) Buckling class decides the axial load carrying capacity of compression members %. Briefly explain. (5)

(b) Design a column to carry an axial super imposed load of 1100 kN. The unsupported length of the column is 4.0 meter. The column is restrained against translation and rotation at both the end @ both the axes. $f_y = 250\ Mpa$. (10)

Total No. of printed pages = 4

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2022

B.Tech. 6th Semester End-Term Examination

ENGINEERING HYDROLOGY

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct answer: (10 × 1 = 10)

(i) In selecting site for a rain gauge, the nearest object should be at a minimum distance of

(a) twice its height

(b) three times its height

(c) equal to its height

(d) anywhere

(ii) Orographic precipitation occurs due to air masses being lifted to higher altitudes by

(a) The density difference of air masses

(b) a frontal action

(c) the presence of mountain barriers

(d) extratropical cyclones

(iii) ϕ-index is defined as

(a) the difference between maximum and minimum infiltration capacity

(b) the difference between maximum and minimum runoff

(c) rainfall intensity above which rainfall volume equals to runoff volume

(d) minimum infiltration rate during the storm

[Turn over

(iv) The S-curve hydrograph is

(a) the summation of the unit hydrograph

(b) the summation of the total runoff hydrograph

(c) the summation of the rainfall hyetograph

(d) all the above

(v) The flow-duration curve is a plot of

(a) accumulated flow against time

(b) discharge against time in chronological order

(c) the base flow against the percentage of times the flow is exceeded

(d) the discharge against the percentage of times the flow is equalled or exceeded

(vi) Base-flow separation is performed

(a) on an unit hydrograph to get the direct-runoff hydrograph

(b) on a flood hydrograph to obtain the magnitude of effective rainfall

(c) on a flood hydrograph to obtain the rainfall hyetograph

(d) on hydrographs of effluent stream only

(vii) The basic assumptions of the unit-hydrograph theory are

(a) nonlinear response and time invariance

(b) time invariance and linear response

(c) linear response and linear time variance

(d) nonlinear time invariance and linear response

(viii) The probable maximum flood is

(a) the standard project flood of an extremely large river

(b) a flood adopted in the design of all kinds of spillways

(c) a flood adopted in all hydraulic structures

(d) an extremely large but physically possible flood in the region

(ix) The hydraulic methods of flood routing use

(a) equation of continuity only

(b) equation of motion only

(c) both the equation of motion and equation of continuity only

(d) energy equation only

(x) For channel routing, the Muskingum storage equation is given by

(a) K [xI + (1-x)Q]

(b) K [xQ + (1-x)I]

(c) K [xQ + (1-x)Q]

(d) K [xI + (1 +x)Q]

2. (a) Explain the different forms of precipitation. How missing annual precipitation at a station is estimated? (8)

(b) What are the common causes of inconsistency in precipitation record? Discuss how consistency of precipitation record can be tested and corrected. (7)

3. (a) Explain how infiltration in field can be measured? What are the different infiltration indices? Explain each of them by sketches where necessary. (8)

(b) The average rainfall over 55 hectares of watershed for a particular storm was as follows:

Time (hr)	0	1	2	3	4	5	6	7
Rainfall (cm)	0	0.75	1.25	3.40	2.95	1.40	0.80	0

The volume of runoff from the storm was determined as 3.20 ha-m. Establish the ϕ-index. (7)

4. (a) Define Unit hydrograph and state its limitations. (4)

(b) What is S-curve ? Explain its uses. (4)

(c) The ordinate 4-hr unit hydrograph are given as :

Time (hr)	UHO (m^3/sec)	Time (hr)	UHO (m^3/sec)
0	0	5	9.2
1	1.8	6	5.3
2	4.9	7	2.8
3	8.8	8	0.9
4	11.9	9	0

Derive S-curve and obtain 1-hr unit hydrograph. (7)

5. (a) What is runoff? Discuss the factors that affect the runoff. Explain any two methods of separation of base flow from the flood hydrograph. (8)

(b) Explain Synthetic unit hydrograph. A basin has 560 sq.km of area, L=30km, L_{ca} = 18km. Assuming Ct = 1.30, Cp = 0.70, develop a 3-hr Synthetic unit hydrograph for the basin using Synder's method. (7)

6. (a) Explain the different methods of estimation of peak flood. Explain briefly the difference between annual duration series & duration series. (7)

(b) The observed annual flood peak in m^3/sec of a river for the period 2001 to 2015 are: 3210, 4000, 2250, 1846, 3160, 2842, 1985, 4260, 2194, 3625, 3180, 1826, 3629, 2944 and 4380. Estimate the peak flood of 100 years return period by Gumbel's method. (8)

7. (a) How does 'stream flow routing' differ from 'reservoir flood routing' ? Discuss Pul's method of reservoir routing. Also give the stepwise solution of the method. (8)

(b) Route the following flood through a reach for which K= 22 hour and X=0.25. Initial outflow = 20 m^3/sec. (7)

Time (hr) :	0	6	12	18	24	30	36	42	48	64	60	66
Inflow (m^3/sec) :	20	80	210	240	215	170	130	90	60	40	28	16

Total No. of printed pages = 4

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Roll No. of candidate | | | | | | | | | | |

2022

B.Tech. 6th Semester End-Term Examination

ENVIRONMENTAL ENGINEERING-II

(New Regulation and New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Answer the following (MCQ/ Fill in the blanks) : (10 × 1 = 10)

   (i) Sewage sickness is the term used for

   (a) Persons who become sick after drinking polluted water

   (b) A treatment plant which does not function properly

   (c) A stream where the flora and fauna die due to sewage flow

   (d) Condition of land where sewage is applied continuously for a long period

   (ii) Waste water treatment units are generally designed for

   (a) Maximum flow only

   (b) Minimum flow only

   (c) Average flow only

   (d) Maximum and minimum flow both

   (iii) The maximum efficiency of BOD removal is achieved in

   (a) Oxidation ditch

   (b) Oxidation pond

   (c) Aerated lagoon

   (d) Trickling filter

(iv) The gas production from a sludge digestion tank is .

(a) Methane only

(b) Carbon dioxide only

(c) 70% methane and 30% carbon dioxide

(d) 30% methane and 70% carbon dioxide

(v) The solid waste management hierarchy is

A. Reuse B. reduce C. Recovery D. Recycle E. Disposal

(a) ABCDE

(b) BACDE

(c) BADCE

(d) ABDCE

(vi) The ultimate BOD value of a waste

(a) Increase with temperature

(b) Decrease with temperature

(c) Remains the same at all temperature

(d) Double with every 10°C rise in temperature

(vii) The station or building which is constructed for temporary collection of solid waste is called as

(a) Terminal station

(b) Transfer station

(c) Collection station

(d) Disposal point

(viii) Which of the following plume behaviors occurs when atmospheric inversion begins from the ground level and continues?

(a) Looping

(b) Fumigation

(c) Coning

(d) Fanning

(ix) A decrease in the radius of cyclone collector will:

(a) increase efficiency

(b) decrease in efficiency

(c) not affect its efficiency

(d) none of the above

(x) The weighting network that is usually used to filter out certain frequencies of sound in our day-to-day sound measurement is of:

(a) A type

(b) B type

(c) C type

(d) None of the above

2. (a) Identify different unit processes and operation in sewage treatment plant by drawing a flow chart. (6)

(b) The sewage flows from a primary settling tank to a standard rate trickling filter at a rate of 5 million litres per day BOD of 150 mg/l. Determine the depth and the volume of the filter, adopting a surface loading of 2500 l/m^2/day and an organic loading of 165 $g/m^3/day$. Also determine the efficiency of the filter unit, using NRC formula. (9)

3. (a) Explain the types of settling in waste water. How will you determine the removal efficiency of a basin? (5)

(b) Why coagulants are used in the sewage treatment? (2)

(c) (i) Design an aerated grit chamber for treating municipal waste water with average flow rate of 45MLD. Assume the peak flow rate to be 3 times the average. (8)

Or

(ii) A 30 cm dia. Sewer having an invert slope of 1 in 150 was flowing full. What would be the velocity of flow and discharge? (N=0.013). Is the velocity self -cleaning? What would be the velocity and the discharge when the same is flowing 0.4 of its full depth? [min velocity for 30 cm dia. Pipe- 75 cm/sec. At 0.4 depth ratio, velocity ratio=0.9, discharge ratio=0.337, aera ratio=0.373, hydraulic mean depth ratio=0.857]. (8)

4. Write short notes on (any *three*) : $(3 \times 5 = 15)$

(a) Describe the treatment of sewage by activated sludge process. Mention the advantages and dis-advantages of this system.

(b) Difference between Attach growth process and suspended growth process, write two examples of each.

(c) Oxidation pond and oxidation ditch

(d) Standard rate trickling filter and high-rate trickling filter

5. (a) Differentiate between the environmental lapse rate (ELR) and adiabatic lapse rate (ALR). (5)

(b) Describe the harmful effects of important air pollutants on materials and services, as well as on aquatic life. (5)

(c) (i) Write about the working principle of gravitational settling chambers (5)

Or

(ii) An air parcel having 40°C temperature moves from ground level to 500m elevation in dry air following the "adiabatic lapse rate". What will be the resulting temperature of air parcel at 500m elevation? (5)

6. (a) What are the physical properties of solid waste. (3)

(b) What are the different types of collection system? Which one is more preferable for your city and why? (2+1+3=6)

(c) The composition of a certain MSW sample and specific weights of its various components are given below. What will be the specific weight *(kg/m3)* of the MSW sample? (6)

Components	Percent by weight	Specific weight (kg/m3)
Food waste	50	300
Dirt and ash	30	500
Plastics	10	65
Wood and yard waste	10	125

7. (a) What are the classifications of sound? Write with examples. (3)

(b) An air conditioner generates a noise level of 75 dB for five minutes every hour. If the background noise level is 55dB, compute the L_{Aeq}. (7)

(c) Determine the sound pressure level from combining the following four levels:

58,62,65 and 68dB. (5)

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2022

B.Tech. 6th Semester End-Term Examination

TRANSPORTATION ENGINEERING — II

(New Regulation & New Syllabus)

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer question No. 1 and any *four* from the rest.

1. Choose the correct answer from the choices given : (10 × 1 = 10)

(i) The first railway line in India was opened for traffic between:

(a) Madras and Bombay

(b) Agra and Bombay

(c) Bombay and Thane

(d) Khandwa and Indore

(ii) For a BG route with M+7 sleeper density, the number of sleepers per rail length is:

(a) 18

(b) 19

(c) 20

(d) 21

(iii) The recommended width of ballast for BG track on Indian Railways is:

(a) 3.53 m

(b) 3.35 m

(c) 2.35 m

(d) 2.53 m

[Turn over

(iv) The main function of a fish-plate is:

(a) To allow rail to expand and contract freely

(b) To join rails with the sleeper

(c) To join the two rails together

(d) None of the above

(v) A falling gradient followed by a rising gradient is known as:

(a) Ruling gradient

(b) Momentum gradient

(c) Pusher gradient

(d) Angular gradient

(vi) The maximum allowable superelevation on BG in India is:

(a) 6mm

(b) 102mm

(c) 124mm

(d) 165mm

(vii) Drift method of tunnelling is used to construct tunnels in:

(a) Soft grounds

(b) Rock

(c) Concrete bed

(d) None of these

(viii) Which one of the following is considered to be an advantage of the heading and benching method of tunnel construction?

(a) It is suitable for construction in unstable rocks

(b) In this method, it is easy to install timber support

(c) Tunneling can be continuous and the work can be expedited

(d) In case of excessive water, it is easy to take correct steps

(ix) At a certain station, the mean of the average temperature is 25°C and mean of the maximum daily temperature is 40°C. What is the airport reference temperature?

(a) 29°C

(b) 30°C

(c) 31°C

(d) 32°C

(x) What shall be the radius of an exit taxiway with design exit speed of 90 kmph and coefficient of friction 0.13?

(a) 550m

(b) 500m

(c) 475m

(d) 449m

2. (a) Draw a typical cross-section of a permanent way. Discuss in brief the basic functions of various components of a railway track. (10)

(b) What are the different data required before selecting a site for an airport? (5)

3. (a) Write different types of gauges with dimensions present in India. Justify the adoption of gauges with its suitability under different conditions? (10)

(b) Write a note on the selection of route for a tunnel. (5)

4. (a) What is meant by Rail wear? How do you classify the rail wear? Explain with diagrams. Write the allowable limits of rail wear. (10)

(b) What is Zoning Laws in Airport Engineering? Discuss it briefly. (5)

5. (a) Explain the behaviour on coned wheels of trains on straight and curved railway tracks. (10)

(b) What is the necessity of ventilation in tunnels? How is it achieved? (5)

6. (a) What do you mean by hauling capacity of a locomotive? Discuss various types of Tractive Resistances encountered by a train on railway tracks. (10)

(b) Explain various factors on which selection of an airport depends. (5)

7. (a) What is the necessity of points and crossings on railways? Draw a double line sketch of a right hand turnout and name its different parts. (10)

(b) Discuss in detail different methods of construction of tunnel in soft soil. (5)