



**ARKAJAIN**  
**University**  
Jharkhand

**6TH Semester End Term Examination: 2021-22.**

**Subject** : Transport Engineering-II **Roll No:** .....

**Course** : B.Tech CIVIL

**Full Marks** : 70 **Time** : 3 Hours.

**Instructions to the Candidates:**

- Read the question paper very carefully.
- Start writing from 2nd page onwards; **don't Write On The 1st Page Backside.**
- Question Paper is divided into Three Parts -A, B & C.
- Part-A is containing 12 multiple choice questions.
- Part- B containing SIX questions out of which FOUR questions are to be answered.
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**PART - A**

**Multiple Choice Questions**

[12x1=12]

1. First Railway Line in India was opened between -
  - a. Bombay and Pune
  - b. Thane and Nagpur
  - c. Bombay and Thane
  - d. Bombay and Nagpur
2. Marking the position of centre line on the ground is known as -
  - a. Gauge
  - b. Cant
  - c. Gradient
  - d. Alignment
3. Flat-Footed Rails have cross-section of -
  - a. I-Shape
  - b. T-Shape
  - c. Inverted T Shape
  - d. Inverted P Shape
4. Standard Rail Lengths used in Indian Railways for BG Tracks are -
  - a. 14m
  - b. 13m
  - c. 10m
  - d. 17m
5. Transverse supports that provide stiffness to a railway track are called -
  - a. Rails
  - b. Sleepers
  - c. Fittings
  - d. Ballast



6. Which of the following is not a component of Rail?

- a. Sleeper
- b. Foot
- c. Web
- d. Head

7. Rail section is designated by its -

- a. Weight
- b. Weight per unit length
- c. Length
- d. Cross-section

8. Why it is necessary for the Joint to hold the Rail ends together?

- a. To make it inelastic
- b. To increase the cost
- c. To make the Joint rigid
- d. To provide continuity

9. How is speed of the train related to the gauge distance provided?

- a. Directly proportional
- b. Inversely proportional
- c. Not related to the gauge distance provided
- d. Varies according to the topography of the place

10. Which of the following is NOT a basic requirement of ideal alignment?

- a. Shortest possible route
- b. Comfort of the passengers
- c. Maximum operational expenses
- d. Safety of the passengers

11. What is the reason that the head should have sufficient depth?

- a. To sustain vertical wear
- b. For lateral stiffness
- c. To make it cheap
- d. For proper maintenance

12. Which track element transfers its load directly to the Ballast?

- a. Sleepers
- b. Wheels
- c. Locomotive
- d. Formation

## PART B

Answer any Four out Of Six

(4x7=28)

1. Describe briefly the history of machine learning?

1. What are the requirements that an Ideal Sleeper must fulfill?
2. Discuss the benefits of Ungauged Policy?
3. State the causes of Derailment in a (any 2)
  - a. Straight Track
  - b. Curved track
  - c. Turnout and Crossing
4. What are the measures that can be taken to reduce Creep?
5. State the functions of Sleepers.
6. What do you understand by 'Rails'? State the functions of Rails.

## PART C

Answer any two out of Four:

(2x15=30)

1. What are the different types of Rails? Explain any 2.
2. State the advantages and disadvantages of Wooden Sleepers.
3. State and explain the factors affecting choice of Gauges.
4. What is a Rail Joint? State the characteristics that an ideal Rail Joint should possess.

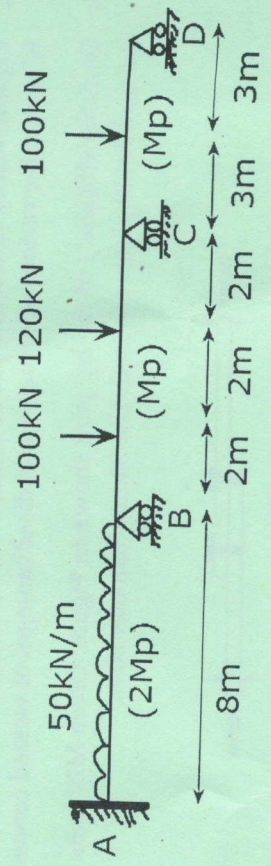


**ANSWER ANY TWO OUT OF FOUR**

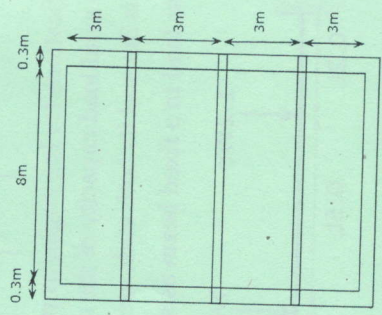
PART C

(2x15=30)

1. Design a double angle tension member connected on each side of a 10mm thick gusset plate to carry an axial factored load of 375kN. Use 20mm black bolts. Assume shop rivet. Take the value of edge distance (e) and pitch (p) as 40mm and 60mm respectively.
2. Design a laced column with two channels back-to-back of length 10m to carry an axial factored load of 1400kN. The column may be assumed to have restrained in position but not in direction at both ends (hinged ends).
3. Determine the plastic moment capacity required in various portions of the continuous beam shown in Figure. The loads shown are in the limiting state.



4. A roof of a hall measuring 8m x 12m consists of 100mm thick R.C slab supported on steel I-beam section spaced 3m apart as shown in the Figure. The finishing load may be taken as 1.5 kN/m<sup>2</sup>, live load as 1.5 kN/m<sup>2</sup> and Self weight as 0.8 kN/m. Design the steel beam.



**6TH Semester End Term Examination: 2021-22.**  
**Subject : Design of Steel Structure-I**  
**Course : B.Tech CIVIL**  
**Full Marks : 70**  
**Roll No: .....**  
**Time : 3 Hours.**

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PART - A

[12x1=12]

Multiple Choice Questions

1. Gross diameter of rivet (mm) of a rivet of 27mm nominal diameter  
 a) 28.5      b) 25.5      c) 29      d) 30
2. For a standard 45° fillet, the ratio of size of fillet to throat thickness is  
 a) 1:1      b) 1: √2      c) √2:1      d) 2:1
3. When two plates are placed end to end and are joined by two cover plates, the joint is Known as  
 a) Lap joint      b) Butt joint  
 c) Chain riveted lap joint      d) Double cover butt joint
4. The strength of a riveted lap joint is equal to its  
 a) Shearing strength      b) Bearing strength  
 c) Tearing strength      d) Least of (a), (b) and (c)

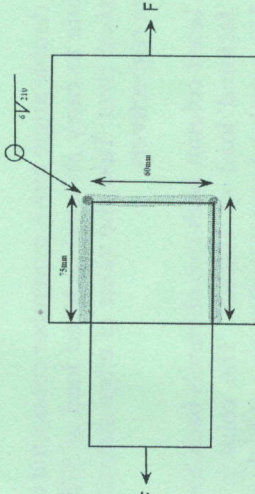


**PART B**

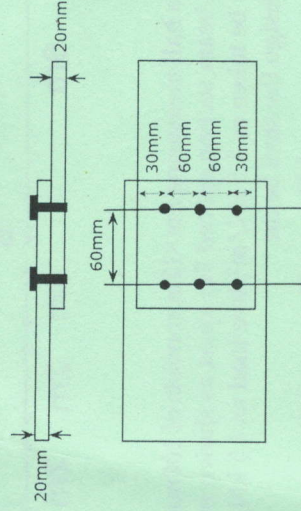
**ANSWER ANY FOUR OUT OF SIX**

(4x7=28)

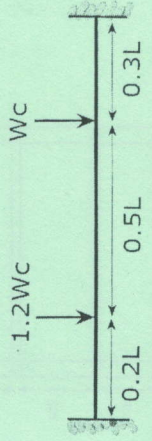
- A fillet weld may be termed as
  - Mitre weld
  - Concave weld
  - Convex weld
  - All the above
- A tension member may fail in:
  - Yielding of gross section
  - Block Shear Failure
  - Rupture of critical section
  - All of these
- The value of maximum slenderness ratio in a tension member in which reversal of direct stress occurs due to loads other than wind or seismic forces is:
  - 350
  - 180
  - 400
  - No Limit
- As per IS 800:2007 which class of buckling is observed in a compression member made by using Channel Section?
  - Class a and b for buckling about z-z axis and y-y axis respectively.
  - Class c and for buckling about z-z axis and y-y axis respectively.
  - Only Class c for buckling about any axis
  - Only Class b for buckling about any axis
- What is the effective length when both ends of compression member are fixed?
  - 0.65L
  - 0.8L
  - L
  - 2L
- What is the value of shape factor in a rectangular column?
  - 1.698
  - 1.5
  - 2.0
  - 2.343In
- In a beam of Rolled Section having outstanding element of compression flange, the limiting width to thickness ratio for Class 1 (Plastic) Cross Section is:
  - 9.4ε
  - 10.5ε
  - 15.7ε
  - 42ε
- The value of K for the angle between fusion faces being 92° is:
  - 0.70
  - 0.65
  - 0.60
  - 0.50

- (i) Determine the safe load that can be transmitted by the fillet welded joint shown in fig. The size of weld is 6mm.
 

- (ii) Determine the rivet value of 18mm diameter rivets connecting 10mm plate which is in double shear. The permissible stresses for rivets in shear and bearing are 80MPa and 250MPa respectively and for plate in bearing is 250MPa.
  - Explain briefly different types of Welded connections and draw their symbols. What are the various advantages and disadvantages of welded connections?
  - Find the efficiency of the lap joint shown in Figure. Given M20 bolts of grade 4.6 and Fe410 plates are used. Use 20mm diameter bolts.



- Describe all the specifications for lug angles as per IS 800:2007.
- Determine the design axial load capacity of the column ISHB 300@577 N/m if the length of column is 3m and its both ends are pinned.
- Determine the collapse load in a fixed beam as shown in Figure.







**6<sup>th</sup> Semester End Term Examination: 2021-22.**

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**Course : B.TECH [CIVIL]**

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**PART - A**

**Multiple Choice Questions**

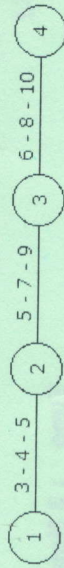
**[12x1=12]**

1. The difference between the maximum time available and the actual time needed to perform an activity is known as \_\_\_\_\_
  - a. Free float
  - b. Total float
  - c. Independent float
  - d. Half float
2. If  $t_o$ ,  $t_p$  and  $t_m$  are the optimistic, pessimistic and most likely time estimates of an activity respectively, the expected time of the activity will be
  - a.  $(t_o + 3t_m + t_p)/3$
  - b.  $(t_o + 4t_m + t_p)/5$
  - c.  $(t_o + 4t_m + t_p)/4$
  - d.  $(t_o + 4t_m + t_p)/6$
3. If an activity has its optimistic, most likely and pessimistic times as 2, 3 and 7 respectively, then its expected time and variance are respectively
  - a. 3.5 and 5/6
  - b. 3.5 and 25/36
  - c. 4 and 5/6
  - d. 4 and 5/6
4. Bar charts are suitable for
  - a. Minor works
  - b. Major works
  - c. Large projects
  - d. All the Above



5. A father notes that when his teenage daughter uses the telephone, she takes not less than 6 minutes for a call and some times as much as an hour. Fifteen minutes call are more frequent than calls of any other duration. If these phone calls were an activity in PERT project, then phone calls expected duration will be
- 15 minutes
  - 20.143 minutes
  - 21 minutes
  - 27 minutes

6. For the network shown in the given figure, the expected time for the activity



- 1-2 is 4
  - 2-3 is 7
  - 3-4 is 8
7. Various activities of a project, are shown on bar charts by
- Vertical lines
  - Dots
  - A dummy activity
  - Is artificially introduced
  - Does not consume time
8. A Milestone chart
- Shows the interdependencies of various jobs
  - Depicts the delay of jobs, if any
  - Points outgoing ahead of schedule of jobs, if any
  - None of these
10. Consider the following features/factors:
- Projects are of the non-repetitive type
  - Time required need not be known
  - Time required is known precisely
  - Events have been established for planning
  - Emphasis is given to activities of project

11. PERT is preferred for planning because of:

- 1, 2 and 4
- 1, 3 and 4

12. Critical path lies along the activities having total float
- Positive
  - Zero
  - 3, 4 and 5
  - 1, 2 and 5

### PART - B

Answer any **FOUR** out of **SIX**

- Define:
  - Rolling resistance
  - Grade resistance
  - Coefficient of traction
  - Rimpull
- What do you understand by Float? Explain the different types of Float.

[4x7=28]

- What are the rules to draw a Network Diagram? How do we number the events?
- What are the various types of Activities? Explain with an example.
- Differentiate between PERT & CPM.
- A four wheel tractor whose operating weight is 13,000 kg is pulled along a haul road having a slope of 4% at a uniform speed. The tension in the toe cable is 1105 kg. What is the rolling resistance of the haul road?

### PART-C

Answer any **TWO** out of **FOUR**

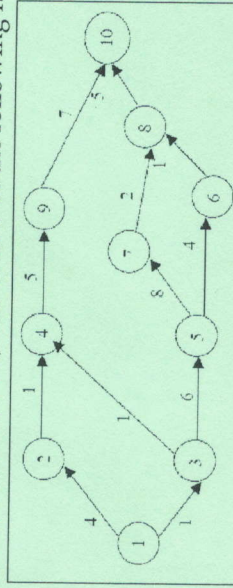
[2x15=30]

- A project has a list of tasks to be performed whose time estimates are given in the table below.

Activity	Activity Name	t <sub>o</sub>	t <sub>L</sub>	t <sub>p</sub>
1-2	A	4	9	8
1-3	B	2	3	10
1-4	C	6	8	16
2-4	D	1	2	3
3-4	E	6	7	8
3-5	F	6	7	8
4-6	G	3	5	7
4-7	H	4	11	12
5-7	I	1	4	6
6-7	J	2	9	10

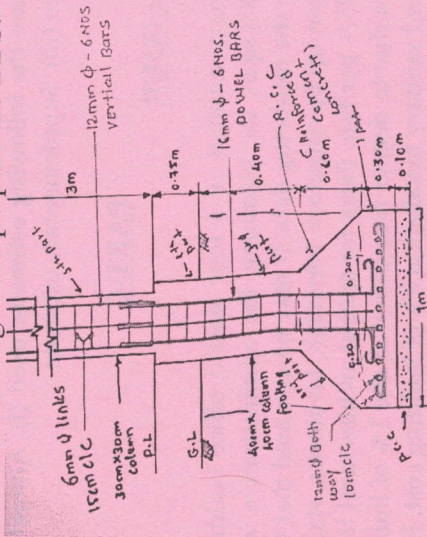
- Draw the Network Diagram
  - Find the Critical Path
2. A four-wheel tractor weighing 18000 kg has weight distribution between the front and the rear wheels of 40 and 60 percent respectively. It is operating on a level haul road whose rolling resistance is 45 kg/tonne. What is the maximum effective rimpull of the tractor if the coefficient of traction between the road surface and the tire is 0.65?
3. 'P' stands for bending, placing and binding of reinforcement by one class of crew, and 'C' stands for concreting done by another class of crew. If construction is to be done in tree ways, draw the network for the following conditions:
- When P and C are available for one set only
  - When P and C are available for each set simultaneously
  - When P is available for each set simultaneously, but C is available for one set only
  - When P is available for one set only, and C is available for each set simultaneously

4. Determine T<sub>E</sub>, T<sub>L</sub>, EST, EFT, LST & LFT of the following network.

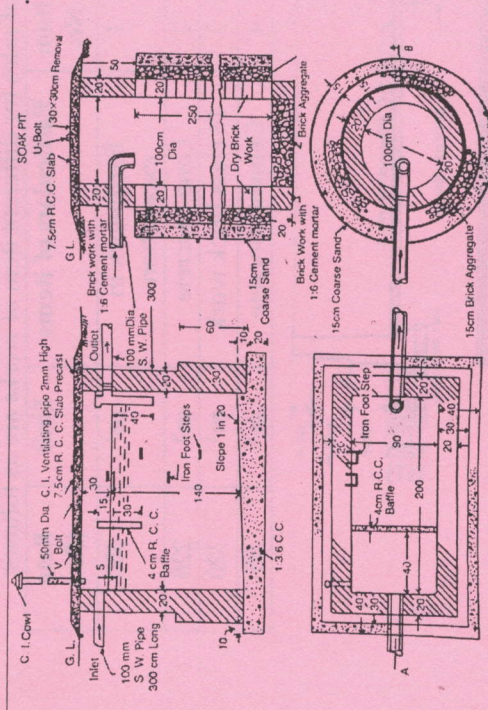




3. Work out the quantities of item of work for RCC square column with foundation as shown in fig. Also prepare the BBS.



4. Estimate the quantity of (i) Earthwork (ii) Concrete in flooring (iii) Brickwork in Footing (iv) Other miscellaneous items for a septic tank along with a soak pit as given in the figure.



PLAN  
All Dimensions in Centimetre unless otherwise Specified.

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**Subject : Engineering Economics Estimation and Coasting**

**Course : B.TECH [CIVIL]**

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**PART - A**

**Multiple Choice Questions**

[12x1=12]

- The brick work is not measured in m<sup>3</sup> in case of:
  - One or more than one brick wall
  - Reinforced brick work
  - Brick work in arches
  - Half brick wall
- The main factor to be considered while preparing a detailed estimate, is
  - Quantity of the materials
  - Transportation of materials
  - Availability of materials
  - All the above
- To make out an estimate for a work the following data are necessary-Drawing, Specification and:
  - Materials
  - Labour
  - rates
  - transportation
- \_\_\_\_\_ is prepared on the basis of plinth area of building, the rate being deducted from the cost of similar building having similar specification, heights and construction, in the locality.
  - Cube Rate Estimate
  - Maintenance Estimate
  - Supplementary Estimate
  - Plinth Area Estimate



- In this method approx. total length of walls is found in running metre and this total length multiplied by the rate per running metre of wall gives a fairly accurate cost.
  - Annual repair
  - Approximate quantity method estimate
  - Item rate estimate
  - Cubical content estimate
- Nominal size of a traditional brick is:
  - 22.9\*11.2\*7.0 cm
  - 19\*9\*9cm
  - 22.9\*11.4\*7.6
  - 20\*10\*10 cm
- Unit of measurement for cut stone work in lintel, beam, etc. is:
  - m
  - m<sup>3</sup>
  - quintal
  - number
- The approximate value of Earnest Money in terms of %age of estimated cost is:
  - 5%
  - 12%
  - 2%
  - 3.5%
- Which of the following authority has the power of accepting the tender up to Rs.50,000?
  - A.E
  - Executive Engineer
  - SDO
  - Chief Engineer
- Which of the following is not a type of estimate?
  - Abstract Estimate
  - Detailed Estimate
  - Supplementary & Revised Estimate
  - RCC Beam Estimate
- The total area of floor in between walls & consist of floor of verandah, corridors, passage etc is called:
  - Plinth Area
  - Floor Area
  - Carpet Area
  - Circulation Area
- On which basis preliminary estimate is prepared for Bridge & Culvert?
  - Per unit basis
  - Per running metre of span
  - Land acquired basis
  - Per km basis

### PART - B

Answer any FOUR out of SIX

- Write a short note on Septic Tank.
- What is the unit of measurement for the following item of work?
  - Rock Excavation
  - Reinforced brickwork
  - D.P.C
  - Honey-Comb brickwork, thickness specified
  - Steel reinforcement bars
- Calculate the quantity of earthwork for 200m length for a portion of road in an uniform ground. The height of banks at the two ends being 1.00m and 1.60m. The formation width is 10m and side slopes is 2:1 (Horizontal: Vertical). Assume there is no transverse slope. Use Prismoidal Formula.
- Define Estimate. What are the data required for estimate? Why there is a need of estimation & costing in a project?

[4x7=28]

- Calculate the number of (i) Standard bricks (ii) Traditional Bricks required in 1cubic meter of a structure.
- When and where are the following estimates used (i). Annual repair estimate (ii) Revised estimate (iii). Supplementary estimate

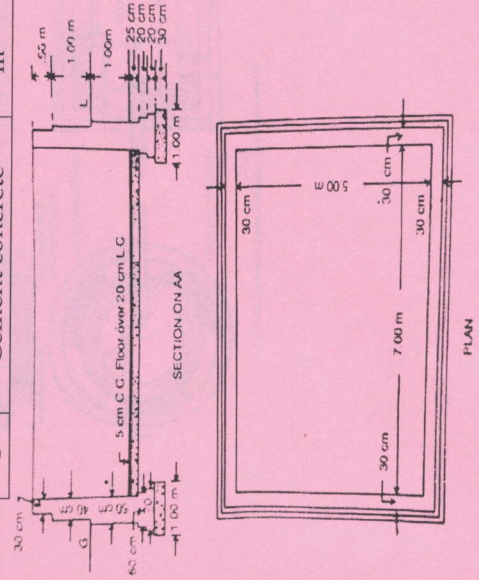
### PART-C

Answer any TWO out of FOUR

[2x15=30]

- Prepare a preliminary estimate of a four storied office building having total carpet area of 2000.sq.m for obtaining the administrative approval of the government, given the following data. It may be assumed that 40% of the built-up area will be taken up by corridors, verandah, lavatories, staircase etc. Plinth area rate is Rs. 1325/- per Esq. Extra for special architectural treatment 0.5% of building cost. Extra due to deeper foundation at site 1% of building cost. Extra for water supply and sanitary installation 8% of building cost. Extra for internal electrical installation 12.5% of building cost. Extra for other services 5% of building cost. Contingencies - 2.5% Supervision charges - 10 %
- Prepare an estimate for a room of height 1.5m as shown in fig. Show the details of measurement, calculation of quantities and abstract of estimated cost. Schedule of rates for different item of works are as follows:

Item No.	Particulars of items	Unit	Rate (Rs.)
1	Earthwork in excavation	m <sup>3</sup>	350
2	Lime concrete	m <sup>3</sup>	220
3	1st class brick work	m <sup>3</sup>	320
4	Cement concrete	m <sup>3</sup>	55







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**PART - A**

**Multiple Choice Questions** [12x1=12]

1. In a drained triaxial compression test, a saturated specimen of a cohesion less sand fails under a deviator stress of 3kgf/cm<sup>2</sup> when the cell pressure is 1kgf/cm<sup>2</sup>. The effective angle of shearing resistance of sand is about:  
 a) 37°      b) 45°      c) 53°      d) 20°
2. A clay soil sample is tested in a triaxial apparatus in CD conditions at a cell pressure of 100kN/m<sup>2</sup>. What will be the pore water pressure at a deviator stress of 40 kN/m<sup>2</sup>?  
 a) 0      b) 20 kN/m<sup>2</sup>      c) 40 kN/m<sup>2</sup>      d) 60 kN/m<sup>2</sup>
3. For a saturated cohesive soil, a triaxial test yields the angle of internal friction (φ) as zero. The conducted test is:  
 a) Consolidated Drained (CD) Test      b) Consolidated Untrained (CU) Test  
 c) Unconsolidated Drained (UD) Test      d) Unconsolidated Untrained (UU) Test

- (i) Backfill fully drained and the wall is free to yield  
 (ii) Wall free to yield, water table at 3m depth and there is no drainage. Determine the point of application of the resultant thrust in case (iii).
2. A strip footing of 1.5m width is present at a depth of 1m from ground level resting over a sand stratum. If dry unit weight of sand is 17kN/m<sup>3</sup>, angle of internal friction of sand is 38°. Using Terzaghi's theory, calculate the ultimate bearing capacity of the foundation if:  
 a) If ground water table is present at a depth of 4.5m below the base of foundation.  
 b) If ground water table is located at a depth of 0.5m below the ground level.  
 c) If ground water table is present at a depth of 0.5m below the base of foundation.
3. (i) A clayey soil, tested in a consolidometer, showed a decrease in void ratio from 1.20 to 1.10 when the pressure was increased from 0.25 to 0.50 kgf/cm<sup>2</sup>. Calculate the coefficient of compressibility (a<sub>v</sub>) and the coefficient of volume compressibility (m<sub>v</sub>). If the coefficient of consolidation (c<sub>v</sub>) determined in the test for given stress increment was 10 m<sup>2</sup>/day, Calculate the coefficient of permeability in cm/sec. If the sample tested at the site was taken from a clay layer of 3.0m thickness, determine the consolidation settlement resulting from the given stress increment.  
 (iii) An 8m thick clay layer with single drainage settles by 120mm in 2years. The coefficient of consolidation for this clay was found to be 6×10<sup>-3</sup> cm<sup>2</sup>/sec. Calculate the likely ultimate consolidation settlement and find out how long it will take to undergo 90% of this settlement

4. Explain the process of performing Standard Penetration Test. Also describe the different types of corrections applied during the test. During the soil site investigation for design of foundation, SPT was conducted. Following readings were taken on site. Calculate the 'N' value and apply the correction if required. Depth of soil sampling is 6m. & saturated unit weight is 19 kN/m<sup>3</sup>.

Penetration (cm)	No. of Blows
0-7.5	3
7.5-15	3
15-22.5	6
22.5-30	6
30-37.5	8
37.5-45	7



4. The most commonly used sampler for obtaining a disturbed sample of the soil is:

- a) Split spoon sampler
- b) Open Drive Sampler
- c) Piston Sampler
- d) Thin wall shell by tube sample

5. The degree of disturbance of the sample collected by the sampler is expressed by a term called area ratio. If the outer diameter and inner diameter of the sampler are  $D_0$  and  $D_1$  respectively:

- a)  $\frac{D_0^2 - D_1^2}{D_1^2}$
- b)  $\frac{D_1^2 - D_0^2}{D_1^2}$
- c)  $\frac{D_0^2 - D_1^2}{D_0^2}$
- d)  $\frac{D_1^2 - D_0^2}{D_0^2}$

6. A foundation is to be called shallow when

- a) Depth > width
- b) Depth < Width
- c) Depth  $\leq$  Width
- d) Depth  $\geq$  Width

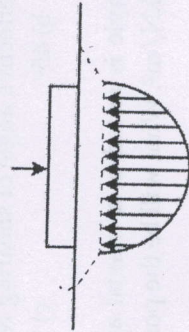
7. The active earth pressure of a soil is proportional to (where  $\phi$  is the angle of friction of the soil)

- a)  $\tan^2 (45^\circ + \phi/2)$
- b)  $\tan^2 (45^\circ - \phi/2)$
- c)  $\tan (45^\circ - \phi)$
- d)  $\tan (45^\circ + \phi)$

8. Failure of the stability of slopes, generally occurs along

- a) Slip plane
- b) horizontal surface
- c) Curved plane
- d) All of these

9. The contact pressure and settlement distribution for a footing are shown in the figure



The figure corresponds to a

- a) Rigid footing over sand
- b) Rigid footing over clay
- c) Flexible footing over sand
- d) Flexible footing over clay

10. Two circular footings of diameter  $D_1$  and  $D_2$  are resting over the same purely cohesive soil. The ratio of their gross ultimate bearing capacities is:

- a)  $(\frac{D_1}{D_2})^2$
- b) 1.0
- c)  $(\frac{D_2}{D_1})^2$
- d)  $(\frac{D_1}{D_2})$

11. The observed value of the standard penetration number (N) at 10m depth of salty sand deposit is 13. The unit weight of soil is  $16 \text{ kN/m}^3$ . The N value after correcting the presence of fines will be:

- a) 12
- b) 15
- c) 14
- d) 15

12. The depth of tension cracks in a soft clay ( $\phi_{cu} = 0^\circ$ ) is:

- a)  $\frac{4c_u}{\gamma}$
- b)  $\frac{2c_u}{\gamma}$
- c)  $\frac{c_u}{\gamma}$
- d)  $\frac{c_u}{2\gamma}$

### PART B

#### ANSWER ANY FOUR OUT OF SIX

(4x7=28)

1. Explain the Plate Load Test in detail.
2. Explain the different types of augers used for Soil exploration.
3. Enlist the various types of Sub-surface Soil Exploration Techniques. What is the minimum depth of borehole for soil sample collection in various structural cases? Explain with the help of diagram
4. Explain in detail the Consolidated Drained Triaxial Test and determine the Shear strength of the soil.
5. Draw the Void ratio vs Effective Stress Curve on arithmetic and logarithmic scale for OCC and NCC. With the help of graph, write down the formula for:
  - i) Coefficient of Compressibility
  - ii) Coefficient of Recompression
6. A conventional drained triaxial compression test was conducted on a normally consolidated clay sample under an effective confining pressure of 220 kPa. The deviatory stress at failure was found to be 400 kPa. An identical specimen of the same clay sample is isotropically consolidated to a confining pressure of 200 kPa and subjected to standard untrained triaxial compression test. Calculate the pore pressure developed (in kPa) if the deviatory stress at failure is 150 kPa.

### PART C

#### ANSWER ANY TWO OUT OF FOUR

(2x15=30)

1. A retaining wall with a smooth vertical back retains sand backfill for a depth of 6m. The backfill has a horizontal surface and has the following properties:

$$c' = 0, \phi' = 28^\circ, \gamma = 16 \text{ kN/m}^3, \gamma_{\text{sat}} = 20 \text{ kN/m}^3$$

Calculate the magnitude of the total thrust against the wall for the condition given below:

Backfill is fully drained but the top of wall is retained against yielding.