

B.E. CIVIL ENGINEERING FOURTH YEAR
SECOND SEMESTER EXAM 2025
SUBJECT: ADVANCED FOUNDATION ENGINEERING
(Name in full)

PAPER ××××

Time: Three hours

Full Marks =100

(50 marks for part I and 50 Marks for part II)

Use a same Answer-Script for each part

Part - I

- Answer any 14 MCQ (in Group A) only from the available 14 MCQs. Each MCQ is carrying 1 mark.
- Some MCQ question may have more than one correct alternative, so examine each alternative of each MCQ before giving your choice of the concerned MCQ.
- Giving all alternatives of any MCQ as your choices as correct answers of the concerned MCQ, will lead to zero marks for the concerned MCQ.
- Questions which belong to Group B (apart from the MCQ questions in Group A), have to be answered following the instructions given in Group B.
- If someone answers more questions than the required number of questions (as directed in Group B), then the answers to the first and successive questions in Group B (which jointly will make the required number of questions that have to be answered in Group B) will be evaluated only.
- Assume reasonable data if it is not supplied.
- Maintain neatness.
- All drawings-must be drawn by pencil.
- All the notations used here for their conventional meanings.
- No code etc. will be needed to answer the questions of this part.

Instructions (with examples) for giving answers to MCQ in this part:

Suppose you have to answer following MCQ in your answer script:

MCQ 1) Name of the present prime minister of the India

- a) Jawaharlal Nehru,
- b) Narendra Modi,
- c) Manmohan Singh,
- d) None of the above.

MCQ 2) Virat Kohli is

- a) Captain of the Indian Cricket team,
- b) Husband of Anuska Sharma,
- c) President of the BCCI,
- d) All of the above.

MCQ 3) Within the last few months

- a) Trump has won,
- b) Biden left himself away from the presidential election,
- c) China attacked India,
- d) All of the above.

Then during giving answer in your answer scripts, you have to give the answers of the above MCQ in the following style only:

Part –II

Answer to MCQ 1) : b) Narendra Modi,

Answer to MCQ 2) : b) Husband of Anuska Sharma,

Answer to MCQ 3) : a) Trump has won,

b) Biden left himself away from the presidential election,

Note:

(A) In MCQ 2, if anyone give alternative "a)" as one of the correct alternative, he/ she is wrong as Virat Kohli was (not "is") Captain of the Indian Cricket team. So, read each word of the alternatives very carefully before giving your answer.

(B) In MCQ 3, if anybody either alternative "a)" or alternative "b)" as the correct alternative, he/ she will get 0.5 marks as there were two correct alternatives.

(C) There is no negative marking for choosing wrong alternative as your choice in any MCQ.

[Turn over

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Part - I

Group- A

Choose the correct alternative/ alternatives for any 14 MCQ from the following 14 MCQ:

Question	CO	Marks
1) Metastable Soils include (A) quick clay (B) loose saturated sands (C) some saprolites either above or below the water tables (D) all of the above (E) (A) and (B) above	CO1	1
2) An open, partially unstable, unsaturated fabric (A) generates high enough net total stress (B) are needed to produce collapse in the soil structure (C) helps cementing agent to perform properly (D) all of the above	CO1	1
3) For soil, _____ phases, two phases come to equilibrium under imposed loads. The most appropriate word to fill the blank, is: (A) two (B) three (C) four (D) depends on the situation	CO1	1
4) The most effective means of reducing the settlement of collapsible soils to tolerable limits, is: (A) grouting method, (B) dynamic compaction method, (C) preloading with sand wicks and drains, (D) None of the above	CO1	1
5) _____ general types of foundations can be considered in expansive soil. The most appropriate word to fill the blank, is: (A) more (B) two (C) three (D) None of the above	CO1	1
6) The formal report for a pumping test should contain the following: (A) information on the adjacent open surface flows near the place of the test (B) information on the adjacent flexible or rigid pavements near the place of the test (C) signature of the local competent authority (D) information on the hydrogeologic setting (E) (A) and (C) above	CO4	1
7) During pumping test, water samples should be collected (A) just before the completion of the pumping test (B) just after the commencement of the pumping test (C) when conditions have stabilized (D) (A) and (B) above	CO4	1
8) "A qualified professional with competency in _____ should be responsible to plan, design, implement and interpret the pumping test"- the most appropriate word to fill the blank, is: (A) hydrogeology, (B) hydrology, (C) geology, (D) Both (A) and (B)	CO4	1

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Part - I

- | | | |
|---|-----|---|
| 9) A pumping test is a practical, reliable method of estimating:
(A) well performance
(B) well yield
(C) the zone of influence of the well and aquifer
(D) All of the above
(E) (A) and (B) above | CO4 | 1 |
| 10) Pumping test water level measurements should be made
(A) prior to the pumping period
(B) during the pumping period
(C) immediately following the pumping period
(D) All of the above
(E) (A) and (B) above | CO4 | 1 |
| 11) Compaction Piles works by
(A) Vibro-compaction
(B) Aggregate placement
(C) Compaction
(D) All of the above
(E) (B) and (C) above | CO5 | 1 |
| 12) Geotextiles are permeable fabrics made from
(A) polypropylene
(B) polyester
(C) natural fibers
(D) all of the above | CO5 | 1 |
| 13) Tamping weight or hammer which is used in heavy tamping, generally varies between:
(A) 10–40 tons
(B) 20–40 tons
(C) 30–50 tons
(D) none of the above | CO5 | 1 |
| 14) For installation of sand drains, boreholes are drilled into the ground, having range in diameter of
(A) 100–250 mm
(B) 150–450 mm
(C) 200–450 mm
(D) 200–750 mm | CO5 | 1 |

Group- B

Answer following three questions.

Answer any three from 15 (a), 15 (b), 15 (c) and 15 (d)

- | | | | |
|------|---|-----|-------|
| 15 a | What is meant by collapsible and expansive soil?
Which characteristics belong to metastable soils? | CO1 | 2+2=4 |
| 15 b | Illustrate the factors (according to Dudley and Barden et al.) which are needed to produce collapse in a soil structure. | CO1 | 4 |
| 15 c | Write short notes on any one of the followings:
i) Foundation design in collapsible soils,
ii) Treatment methods for collapsible soils. | CO1 | 4 |
| 15 d | Regarding the behaviour of compacted collapsing soils, some points are recognized by geotechnical engineering currently. Illustrate those points. | CO1 | 4 |

Answer any three from 16 (a), 16 (b), 16 (c) and 16 (d)

- | | | | |
|------|---|-----|---|
| 16 a | What are the key things to consider when designing and planning a pumping test? | CO4 | 4 |
|------|---|-----|---|

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Part - I

- | | | | | |
|----|---|---|-----|---|
| 16 | b | Is a water sample required for analysis during a pumping test? | CO4 | 4 |
| 16 | c | What should be in a pumping test report? | CO4 | 4 |
| 16 | d | A pumping-out test was carried out in the field for an 18 m thick sand layer with the co-efficient of permeability of the sand layer as 38.70 m/day. The groundwater table was located at a depth of 2.2 m below the ground level. A steady state was reached when the discharge from the well was Q lit/sec. At this stage, the drawdown in the test well was 2.54 m, while the drawdowns in two observation wells situated at 8 m and 20 m from the test well were found to be 1.76 m and 1.27 m respectively. Determine;
(i) The value of Q.
(ii) radius of influence of the test well | CO4 | 4 |

Answer any three from 17 (a), 17 (b), 17 (c) and 17 (d)

- | | | | | |
|----|---|---|-----|-------|
| 17 | a | How do the compaction piles work?
State about the applications of the compaction piles. | CO5 | 2+2=4 |
| 17 | b | Illustrate the functions of Geotextiles in respect of Ground Improvement. | CO5 | 4 |
| 17 | c | In the method of heavy tamping, what are the principles of operation for the improvement of the ground? | CO5 | 4 |
| 17 | d | Write short notes on the preloading with sand drains/sand wicks for the ground Improvement. | CO5 | 4 |

End of the questions

B.E. CIVIL ENGINEERING FOURTH YEAR SECOND SEMESTER EXAM 2025
ADVANCED FOUNDATION ENGINEERING

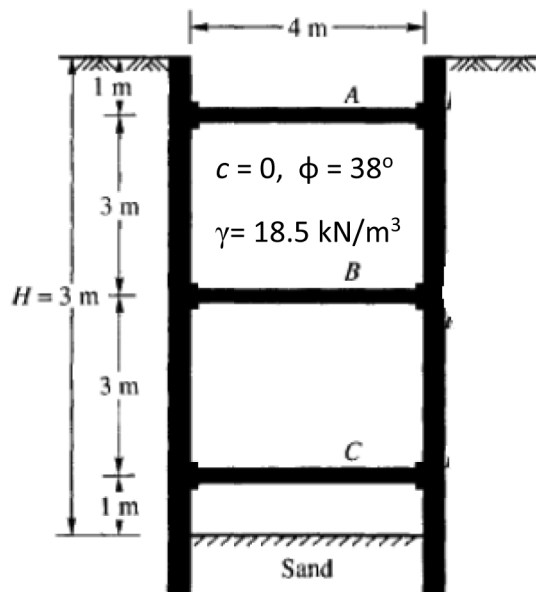
Time: 3 Hours

Part – II

Full Marks: 100 (50+50)

Answer should be brief and to the point.
Assume any data reasonably if needed
 Attempt All Questions

- | | | | |
|-------|---|----|-----|
| 1. a) | Write the names of different types of Caisson foundation. Discuss the advantages and disadvantages for each type. | 7 | CO2 |
| b) | Discuss how the grip length and scour depth are selected in well foundation. How these are related to total depth of well foundation? Explain with schematic diagram. | 7 | |
| c) | Discuss how to find the maximum allowable horizontal force and maximum bending moment in a well foundation using Terzaghi's method. | 10 | |
| d) | Explain four different methods to rectify tilts and shifts of well foundation. | 6 | |
2. a) A long trench is excavated in medium dense sand for the foundation of a multistorey building. The side of the trench are supported with sheet pile walls fixed in place by struts and wales as shown in the figure. Find:
- The pressure distribution on the walls with respect to depth.
 - Strut loads. The struts are paced horizontally at distances $L=4$ m center to center.
 - Maximum bending moment for determining the pile wall section.
 - Maximum bending moment for determining section of the wales.



12

CO3

- b) Discuss the procedure to find the active force on bracing system based on general wedge theory.

8

-:The End:-