

Serial No. 0401

AE

CIVIL ENGINEERING
Paper-II
(Conventional)

Time Allowed : Three Hours

Maximum Marks : 200

INSTRUCTIONS

Please read each of the following instructions carefully before attempting questions :

There are SEVEN questions in all. Candidates should attempt any FIVE questions.

All questions carry equal marks. The number of marks carried by a part of a question is indicated against it.

Answers must be written in ENGLISH only.

Unless otherwise mentioned, symbols and notations have their usual standard meanings.

Assume suitably data, if necessary and indicate the same clearly.

Neat sketches may be drawn, wherever required.

All parts and sub-parts of a question are to be attempted together in the answer book.

Any pages left blank in the answer book must be clearly struck out.

1. (a) State the assumptions of theory of consolidation and its derivation.

10 Marks

- (b) Explain and discuss the use of liquidity index, activity number, thixotropy and sensitivity of soil?

10 Marks

- (c) Give the difference in soil characteristics such as structure, permeability upon saturation, shear strength, stress strain behaviour, compressibility and swelling behaviour when it is compacted on the dry side of OMC and wet side of OMC.

10 Marks

- (d) A sample of sand above water table was found to have a natural water content of 15% and a unit weight of 18.44 kN/m^3 . Laboratory test on dried sample indicated values of 0.50 and 0.85 for minimum and maximum void ratio respectively for densest and loose states. Calculate the degree of saturation and the relative density. Assume $G=2.55$.

10 Marks

2. (a) In an unconfined compression test, a sample of clay 200 mm long and 50 mm diameter fails under a load of 160 N at 8% strain. Calculate the shearing resistance taking into account the effect of change in cross section of the sample.

15 Marks

- (b) A water tank is supported by a ring foundation having outer and inner diameter of foundation as 10 m and 7.5 m respectively. This transmits uniform load intensities of 160 KN/m^2 . Compute

efficiency of transmission. Take friction factor $f=0.02$

10 Marks

- (b) Two pipes each of length L and diameter D_1 and D_2 are arranged in parallel, while a total quantity of Q flows through them, the loss of head, being h_1 . If the pipes are arranged in series and the same quantity of water, Q flow through them, the loss of head is h_2 . If $D_1=2D_2$ find the ratio of h_1 and h_2 . Neglect minor losses and friction factor is constant.

10 Marks

- (c) Find the power required to flow a plate of dimensions $1.25\text{ m} \times 3.0\text{ m}$ in water at 20° C (kinematic viscosity $=9.3 \times 10^{-3}$ stokes) with 3 m side in flow direction, at a velocity of 1.0 m/sec . Make allowance for the fact that the boundary layer changes from laminar to turbulent on the plate. Find the length of the plate over which the boundary layer is laminar. Take critical Reynolds number as 5×10^5 .

10 Marks

- (d) Calculate the quantity of water that will be discharged at a uniform depth of 0.9 m in a 1.2 m diameter pipe which is laid at a slope of 1 in 1000 . Assume Chezy's $C=58$.

10 Marks

5. (a) Define cutbacks and their type

10 Marks

- (b) Calculate the extra widening of pavement and the length of transition curve needed on a two lane



highway having a longitudinal circular curve radius 300 m. Design speed= 80 kmph. Length of wheel base of largest vehicle= 6m.

10 Marks

- (c) On one way traffic road the speed of overtaking and overtaken vehicles are 80 kmph and 50 kmph respectively. If the acceleration of the overtaking vehicle is 2.5 kmph, calculate the safe overtaking sight distance (assume the spacing between vehicles=16m and reaction time of driver = 2 seconds).

10 Marks

- (d) Describe the factor which governs the width of right of way.

10 Marks

6. (a) Design a regime channel to carry a discharge of 100 cumecs in a soil having a silt factor of 1.1, using Lacey's theory. Assume side slope of 0.5 H:1 V.

15 Marks

- (b) Explain Bligh's creep theory for design of a weir on permeable foundations. State its limitations.

15 Marks

- (c) Explain the following.

- i. Aquifers
- ii. Aquitard
- iii. Aquiclude

10 Marks