

2010
CIVIL ENGINEERING
Paper 1

Time : 3 Hours]

[Maximum Marks : 300

INSTRUCTIONS

*Candidates should attempt **all** the questions in Parts A, B & C. However, they have to choose only **three** questions in Part D.*

Answers must be written in the medium opted (i.e. English or Kannada).

This paper has four parts :

A	20 marks
B	100 marks
C	90 marks
D	90 marks

Marks allotted to each question are indicated in each part.

SEAL

[Turn over

PART A

4×5=20

Answer all questions. Each question carries 5 marks.

1. (a) Differentiate between statically determinate and statically indeterminate structures.
- (b) What are Newtonian fluids ?
- (c) Define the terms : Hydraulic gradient line and Total energy line.
- (d) How are soils classified based on their grain size, as per recommendations of the Bureau of Indian Standards ?

PART B

10×10=100

Answer all questions. Each question carries 10 marks.

2. Explain the procedure of analysis of continuous beams by Moment Distribution Method, including beams with sunken supports.
3. Design a suitable fillet welded joint between two plates of size 160 mm × 8 mm and 200 mm × 8 mm to develop the full strength of the smaller plate in tension. Assume allowable tensile stress in the plates as 140 N/mm².
4. What are the assumptions made in the limit state design of concrete structures ? What are the recommendations of the Indian Standard code in this regard ?
5. Derive an expression for capillary rise (of water) in a glass tube, when the bottom end of the tube is dipped in a tub of water.
6. Explain (i) steady and unsteady flows (ii) uniform and non-uniform flows.
7. Derive an expression for the average coefficient of permeability in layered soils [with three layers of thicknesses H_1 , H_2 and H_3 from top; with coefficients of permeabilities of the individual layers being k_1 , k_2 and k_3 respectively] when flow is vertical and normal to the bedding planes.
8. Explain the types of triaxial shear tests based on drainage conditions. What do you understand by effective and total shear strength parameters ? Discuss their utility in geotechnical designs.
9. What is SPT ? What are the corrections applied to the observed blow counts ? How is SPT value useful in estimating the load carrying capacity of individual piles ?
10. What are low level and higher level computer languages ? List any five programming languages and their main purposes.
11. Define the following fluid properties, giving their units :
 - (i) Specific weight,
 - (ii) Specific volume, and
 - (iii) Viscosity.

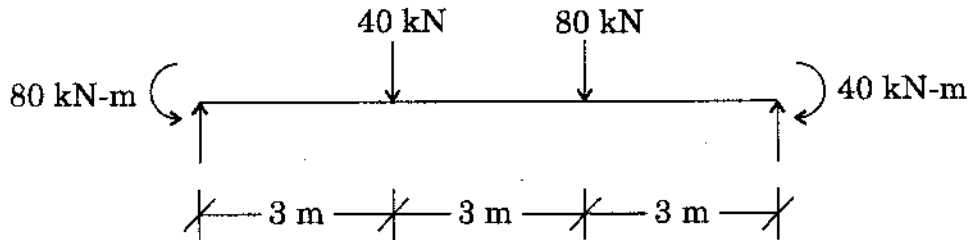
[Turn over

PART C

6×15=90

Answer all questions. Each question carries 15 marks.

12. Sketch the shear force and bending moment diagrams for the beam shown in Figure below :



13. Design a compression member, using any one of the angle sections available shown in table below, whose effective length is 2.95 m and to carry a compressive load of 65 kN.

- (i) ISA 75 × 75 × 10 with sectional area of 1402 mm² and minimum radius of gyration.
- (ii) ISA 80 × 80 × 10 with sectional area of 1781 mm² and minimum radius of gyration (r) of 15.4 mm.
- (iii) ISA 90 × 90 × 10 with sectional area of 2012 mm² and minimum radius of gyration (r) of 16.4 mm.

Permissible stresses are :

1/r	Permissible stress in MPa	1/r	Permissible stress in MPa
100	84	160	42
120	67	170	37
140	53	180	33
150	47	200	27

14. What is dimensional analysis ? Discuss the methods of dimensional analysis.

15. Find the discharge through a trapezoidal channel, of bottom width 8 m with side slopes of 1H : 3V. The depth of flow of water is 2.4 m and value of Chezy's constant is 50. Slope of the bed of the channel is 1 in 4000.
16. The soil stratum at a site consists of a 5 m thick layer of sand at top, overlying a 6 m thick clay layer. Ground water table at site is at 3 m depth below the ground surface. Neglecting capillary effects draw total, neutral and effective stress diagrams. Other data available are :

Sand	$E = 0.6$, $S = 40\%$ above water table, $G = 2.65$
Clay	$w = 45\%$; $G = 2.7$

17. With a neat sketch showing all the components of a (Vidalean) Reinforced Earth Retaining wall, explain the role of each component. What are the advantages of Reinforced Earth ?

PART D

3×30=90

Answer any **three** of the following five questions. Each question carries 30 marks.

18. (a) Explain the external stability checks to be performed in the analysis of conventional gravity retaining walls and also in case of reinforced earth retaining walls.
- (b) A masonry retaining wall, of trapezoidal section and 4.5 m high has top and base widths of 0.6 m and 2.4 m, respectively. The back of the retaining wall is smooth and vertical and the backfill soil has a unit weight of 18 kN/m^3 to its full height, with angle of internal friction of 30° . Assume SBC of foundation soil as 150 kN/m^2 and coefficient of friction at base as 0.7. Check the external stability of the retaining wall and give your comments. 2×15
19. (a) What is boundary layer ? Differentiate between laminar boundary layer and turbulent boundary layer.
- (b) What are the methods of preventing the separation of boundary layer ?
- (c) Define displacement thickness and what is the expression for displacement thickness ? 3×10
20. (a) What are the modes of vibrations of a block foundation ? Illustrate with a sketch.
- (b) What are the types of machine foundations ?
- (c) What are the design criteria to be followed while designing machine foundations ?
- (d) Define coefficient of elastic uniform compression and coefficient of elastic uniform shear. Give the relationship between the two. $4 \times 7 \frac{1}{2}$
21. (a) Clearly differentiate between consolidation and compaction.
- (b) What do you understand by normally consolidated, over consolidated and under consolidated clays ?

- (c) The soil stratum at a site consists of a 5 m thick top layer of sand overlying a 6 m thick clay layer. Clay layer is underlain by rock. Ground water table at site is 3 m below the ground surface. Sand above the water table has a unit weight of 19 kN/m^3 . Saturated density of sand is 21 kN/m^3 . Saturated density of clay is 19.5 kN/m^3 . Liquid limit of clay is 70% and its original voids ratio was 0.65. Additional vertical stress at the centre of the clay layer due to the construction of a building is 100 kN/m^2 . Depth of foundation is 2.5 m. Estimate the magnitude of primary consolidation settlement. 3×10
22. (a) What is the difference between a parallel port and a serial port (of a computer) ?
- (b) Write a FORTRAN program to display the results of 200 tests on 100 specimens of a certain building material. Each specimen was subjected to two tests namely T1 and T2. Acceptance criteria for each sample are (i) that results of both tests T1 and T2 should be more than 75 units *or* (ii) Result of test T1 should be more than 80 units and result of test T2 should be more than 60 units. $10+20$

2010
CIVIL ENGINEERING

Paper 2

Time : 3 Hours]

[Maximum Marks : 300

INSTRUCTIONS

Candidates should attempt **all** the questions in Parts A, B & C. However, they have to choose only **three** questions in Part D.

Answers must be written in the medium opted (i.e. English or Kannada).

This paper has four parts :

A	20 marks
B	100 marks
C	90 marks
D	90 marks

Marks allotted to each question are indicated in each part.

SEAL

[Turn over

PART A

Answer all questions. Each question carries 5 marks.

4×5=20

1. (a) What is ferrocement ? What are the materials used ? Give some practical applications of ferrocement.
- (b) How are roads classified ?
- (c) Give the general water budget equation for a catchment.
- (d) What is a traffic rotary and what is its main objective ?

PART B

Answer all questions. Each question carries 10 marks.

10×10=100

2. With neat sketches, explain the main features of English and Flemish bonds.
3. What are the basic rules for CPM network ? What are the advantages of CPM ?
4. Explain the CBR method of design of pavements.
5. Soil stratum at a site consists of a 9 m thick top clay layer underlain by a 1.5 m thick sand layer underlain by impermeable rock. Water is pumped out of a main well dug up to the rock layer. At steady state, the rate of flow was found to be 54 cu.m./hour. Water levels in two observation wells located at radial distances of 6 m and 15 m from axis of main well were 5 m and 4.5 m below the ground surface, respectively. Compute the coefficient of permeability of the sand layer.
6. What are the types of rails used in railways ? What are the requirements of an ideal rail ?
7. What is turbidity ? Explain how turbidity can be measured in the laboratory.
8. Differentiate between structural and non-structural cracks in buildings. What are the principal causes of development of cracks in buildings ? Discuss any two of these causes in detail.
9. Give detailed specifications for supplying and fixing Indian pattern water-closet including flushing cistern.
10. Write a detailed note on EIA of thermal power plants.
11. Discuss the factors influencing the choice of the type of dam at a given site.

[Turn over

PART C

Answer all questions. Each question carries 15 marks.

6×15=90

12. Give a comparison between slow sand filter and rapid gravity filter.
13. What is a WBM road ? Briefly explain the method of construction of WBM roads.
14. Give the permissible water quality standards for drinking water.
15. Explain BOD.
2.5 ml of raw sewage has been diluted to 250 ml. The D.O. concentration of the diluted sample at the beginning of the BOD test was 8 mg/l. If after 5 days incubation at 20°C, the D.O. concentration of the diluted sample reduced to 5 mg/l, determine the BOD of the raw sewage.
16. What are the component parts of a permanent way ? State the requirements of an ideal permanent way.
17. What are the objectives of river training ? How are river training works classified ? Explain any two methods of river training.

PART D

3×30=90

Answer any **three** of the following five questions. Each question carries 30 marks.

18. What are the various aspects of geometric design of roads ? Explain each one of them briefly.
19. Explain the different types of spillways generally provided to dispose off the surplus water from dam reservoirs.
20. (a) What is superelevation ? Explain with a sketch.
- (b) The radius of a horizontal circular curve is 100 m. The design speed is 50 kmph and the design coefficient of lateral friction is 0.15. Calculate the
- (i) Superelevation, if full lateral friction is acting.
 - (ii) Coefficient of friction needed, if no superelevation is provided.
 - (iii) Equilibrium superelevation, if pressure on the inner and outer wheels should be equal. 10+20
21. Write a detailed note on digestion and disposal of primary and secondary sludge.
22. (a) Write a note on elements of fire proof construction.
- (b) How can the ventilation and illumination of a room be improved ?
- (c) What are the functions of
- (i) Septic tank
 - (ii) Soak well
 - (iii) Leach pit
 - (iv) Manhole 8+10+12