

2008
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.

PART A

Answer all questions. Each question carries 5 marks.

4×5=20

1. (a) What is a three-hinged arch ? Give the salient points in the analysis of a three-hinged arch having its supports on the same level.
- (b) Discuss the various types of losses of prestress in a prestressed concrete member.
- (c) What is Reynolds' number ? Discuss its utility.
- (d) With a relevant sketch, show the various modes of vibrations in the case of machine foundations. What are the types of machine foundations ?

PART B

Answer all questions. Each question carries 10 marks.

10×10=100

2. State Castigliano's theorems. Briefly explain how to analyze a statically indeterminate structural frame by the strain energy method (due to bending). 5+5
3. What is a PSC member ? Explain with relevant sketches, the general principles of prestressing. 3+7
4. Explain the characteristics of the specific energy diagram as applicable to open channel flow. 10
5. Define the following fluid properties and give their units : 10
 - (i) Specific Weight
 - (ii) Kinematic Viscosity
 - (iii) Surface Tension
 - (iv) Vapour Pressure
6. Compare and contrast RAM and ROM as applicable to computers. 10
7. Differentiate between shallow foundations and deep foundations. Explain how piles are classified based on the (i) load transfer mechanism, (ii) method of formation or method of installation. 3+3+4
8. Define the following and state their significance : (i) Froude's number, (ii) Euler's number, (iii) Mach's number. 10
9. At a particular construction site, the soil strata consists of a 6 m thick clay layer (saturated density = 18 kN/m^3), underlain by rock and overlain by a 8 m thick silty sand layer (saturated density = 20 kN/m^3). Water table which was originally at the ground level (top of silty sand layer) was lowered to 4 m below the ground level after the construction. Calculate the increase in effective stress at the centre of the clay layer. Draw the total stress, effective stress and neutral stress diagrams before and after the lowering of ground water table (from the ground level to the top of the rocky strata). 10
10. Explain briefly the Standard Penetration Test. Discuss its utility and importance in geotechnical engineering practice. 6+4
11. Compare the design criteria to be satisfied in the case of ordinary foundations and machine foundations. Write a note on vibration isolation in case of machine foundations. 5+5

[Turn over

PART C

Answer all questions. Each question carries 15 marks.

6×15=90

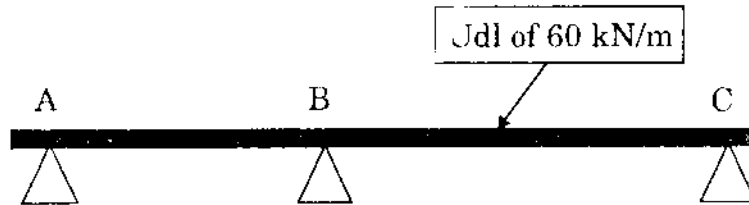
12. Explain the steps involved in the design of a welded plate girder. 15
13. Explain clearly, with the help of relevant sketches, what do you understand by balanced section, under-reinforced section, over-reinforced section as applicable to RCC structures. 15
14. An orifice meter with orifice diameter 9 cm is inserted in a pipe of 20 cm diameter. The pressure difference measured between upstream and downstream of the orifice meter is 10 N/cm^2 . Coefficient of discharge for the meter is given as 0.6. Find the discharge of water through the pipe. 15
15. Write a detailed note on IRC loading for the design of road bridges in India. 15
16. (a) Describe the various types of earth pressures with relevant sketches. Give expressions for the coefficients of these earth pressures.
- (b) A vertical cut is made in saturated clay with $c = 30 \text{ kN/m}^2$, $\Phi = 0$ and $\gamma = 20 \text{ kN/m}^3$. What is the theoretical depth to which the clay can be excavated without side collapse ? 10+5
17. (a) How are triaxial tests classified based on drainage conditions ? Explain.
- (b) Define total and effective shear strength parameters and explain how these parameters vary with the drainage conditions for all types of soils. $7\frac{1}{2}+7\frac{1}{2}$

PART D

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

3×30=90

18. Analyse the continuous beam shown in the figure below by the moment distribution method and draw the shear force and bending moment diagrams. Assume constant 'I'. AB = 4 m and BC = 6 m. 30



19. (a) What is a flow net ? What are the properties of the flow net ? Explain the uses of a flow net.
- (b) What are the advantages of steel structures ? Discuss in brief the specifications to be considered in the design of a riveted joint. 15+15
20. A double overhang roof slab is supported on two (very long) walls 4.5 m apart (centre to centre distance). Clear inside height to the roof slab above the floor is 3.6 m. The slab extends beyond both the walls for 1.25 m (beyond the centre of walls). Live load expected on the slab is 4000 N/m^2 . Adopting M 15 grade concrete and Fe 415 grade steel, design the slab for a total thickness of 180 mm. Give all necessary (simple hand drawn) sketches showing clearly the reinforcement details, which can be used straightaway for execution at site. 30
21. (a) How are soils classified based on their grain size ? Explain how the soils are classified according to the Unified Soil Classification System.
- (b) Differentiate between (i) immediate and consolidation settlements, (ii) direct shear tests and triaxial shear tests, (iii) effective stress paths for normally consolidated soils and over consolidated soils. 15+15

| Turn over

22. (a) Compression tests are performed on 'N' numbers of standard concrete cubes as a part of a quality monitoring exercise in a major construction project. Write a flow chart to pick the largest value of compression strength from the 'N' number of compression tests performed.
- (b) Write a note on GO TO statement (in FORTRAN programming).
- (c) Identify whether the following GO TO statements are valid or invalid and why :
- (i) GO TO 0
 - (ii) GO TO 235
 - (iii) GO TO 1,335
 - (iv) GO TO I
 - (v) GO TO 949494
 - (vi) GO TO 10+5
- (d) Write a subroutine programme (which may be called by the Main Program) for transposing a 20×20 Matrix. *10+5+5+10*

SEAL

05/2

2008
CIVIL ENGINEERING
Paper 2

Time : 3 Hours]

[Maximum Marks : 300

INSTRUCTIONS

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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

PART A

Answer all questions. Each question carries 5 marks.

4×5=20

1. (a) Write a brief note on bar chart for construction scheduling.
- (b) What do you understand by right-of-way of a road ? What are the factors deciding the width of the right-of-way ?
- (c) What is run-off ? What are the factors that affect the run-off from a catchment area ?
- (d) What are the general requirements of any water distribution system ?

PART B

Answer all questions. Each question carries 10 marks.

10×10=100

2. Differentiate between PERT and CPM.
3. With the help of a neat diagram, explain the hydrologic cycle.
4. What is super-elevation ? How do we calculate the same ? What are the limitations of super-elevation for various terrains ?
5. What are the types of plaster ? Discuss briefly. Enumerate the purposes of providing plastering for buildings.
6. Write a brief note on DPC treatment in buildings for flat roofs, parapets and copings (emphasize on method of water-proofing and materials used).
7. Explain the terms 'duty' and 'delta'. What are the factors affecting duty ? How can duty be improved ?
8. What are the main causes of water pollution ? How can water pollution be controlled ?
9. What is the action of coagulants added to raw water ? What are the factors affecting good coagulation ?
10. Write brief notes on :
 - (i) Green house effect
 - (ii) CO₂ fertilization effect
 - (iii) Ozone hole
11. Differentiate between BOD and COD. Briefly explain the importance of (i) pH adjustment and (ii) incubation at controlling temperature – in the laboratory determination of BOD of wastewater sample.

PART C

Answer all questions. Each question carries 15 marks.

6×15=90

12. Define Stopping Sight Distance and Overtaking Sight Distance.
The speeds of overtaking and overtaken vehicles are 80 kph and 30 kph respectively on a two way traffic road. If the acceleration of the overtaking vehicle is 4 kph per sec calculate the safe overtaking sight distance and determine the minimum length of overtaking sight zone.
13. What is camber ? Discuss the objectives for providing camber and the factors on which the amount of camber provided depends. Specify the recommended ranges of camber for different types of pavement surfaces.
14. What do you understand by 'Orientation' ? Discuss the criteria used in deciding orientation of buildings under Indian conditions.
15. A multi-storeyed building is proposed to be constructed supported on raft foundation. Recommended depth of foundation is 2 m and the groundwater table at site is well below the bottom of foundation excavation. The earthwork contractor is expected to do the excavation work mechanically by using excavators. Write a detailed specification for earthwork in excavation for foundation in such a case.
16. What do you understand by unit hydrograph ? How is it derived ? Explain its use in construction of flood hydrograph resulting from two or more periods of rainfall.
17. Explain the Hardy Cross Method for analysis of (water supply) distribution systems.

PART D

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

3×30=90

18. (a) Discuss the various methods available for the design of flexible pavements.
- (b) With neat sketches, wherever necessary, write a detailed note on :
- (i) Railway signals
- (ii) Transition curves

15+15

19. (a) What are the objectives of river training ? How are river training works classified ?
- (b) Determine the factor of safety of a zoned (earth and rockfill dam) for the following data :

Shell Material : $C = 25$ kPa; $\Phi = 35^\circ$; length of slip circle through shell material is 55 m

Core Material : $C = 80$ kPa; $\Phi = 10^\circ$; length of slip circle through shell material is 40 m

Take $\sum U = 16000$ kN, $\sum N = 185000$ kN and $\sum T = 62000$ kN

- (c) A stream has a width of 25 m, depth of 3.5 m and a mean velocity of 1.3 m/sec. Find the height of a weir to be built on the stream floor to raise the water level by 1 m. Assume value of discharge coefficient as 0.9.

10+10+10

20. (a) Discuss the various methods for energy dissipation below spillways.
- (b) Compute the discharge over an ogee weir with coefficient of discharge equal to 2.5 at a head of 4 m. The length of the spillway is 90 m. The weir crest is 8 m above the bottom of the approach channel. Assume the widths of the approach channel and spillway to be same.

21. (a) Discuss the circumstances under which the following roofs are adopted :
- (i) sloping roof
 - (ii) flat roof and
 - (iii) shell roof.
- (b) Draw the details of tubular steel roof truss (compound fink truss). State the maximum span to which this particular type of roof truss can be used. 15+15
22. (a) Describe with neat and relevant sketches, the process of activated sludge treatment as used at sewage treatment plant.
- (b) Compare the activated sludge process with trickling filter process and discuss the merits and demerits of each method. 15+15

SEAL