

Selection Guaranteed here

Develop India Group

Visit at : <https://www.developindiagroup.co.in/>

You can find here

**Current Affairs | Latest Jobs | Syllabus | Admit
Cards | Question Papers | cut off |
Answer keys | Results**

Develop India Group India's largest online complete study notes providing website. We are providing complete study notes for UPSC Exams and all state civil services examinations like UPPSC, MPPSC, BPSC, JPSC, CGPSC, UKPSC, RAS/RTS etc. Except in these exams we are providing study notes for Judicial, IIT JEE, Engineering and medical entrance, GATE, CSIR, UGC NET, Banking, RRB and SSC exams.

Visit this site for more : <https://www.developindiagroup.co.in/>

CIVIL ENGINEERING

PAPER-I

Full Marks : 200

Time : 3 hours

*The figures in the margin indicate full marks*Candidates should attempt **five** questions out of **ten** questions. Question No. **1** is compulsory1. Answer any *four* of the following : $10 \times 4 = 40$

(a) Explain and differentiate between compressibility, compaction and consolidation with reference to soil data.

(b) How will you determine the bearing capacity of soil by plate load test?

(c) Explain IF and DO statements used in computer programming. Illustrate with an example.

(d) Two plates of 10 mm and 18 mm thick are to be joined by double-cover butt joint. The joint is double riveted with cover plates 8 mm thick. The load to be transferred to the joint is 500 kN. Design the joint.

12Y-100/23

(Turn Over)

Civil Engg - I

5 Ques (Q. 1 Comp)

1- a-f - $10 \times 4 = 40$

2- a-10
b-15
c-15 } = 40

3- a-10
b-15
c-15 } = 40

4- a-20
b-10
c-10 } = 40

5. a-15
b-10
c-15 } = 40

6- a-15
b-15
c-10 } 40

7- a+b - $20 \times 2 = 40$

8. a-10
b-8+7=15
c-15 } = 40

9. a-10
b-15
c-15 } = 40

10. a-f - $10 \times 4 = 40$

- (e) An annular plate 4 m external diameter and 2 m internal diameter with its greatest and least depths below the surface being 3 m and 1.5 m respectively. Calculate magnitude and location of the force acting upon one side of the plate due to water pressure.
- (f) A two-dimensional flow is described by the velocity components $u = 5x^3$ and $v = -15x^2y$. Evaluate the stream function and acceleration at point $P(x = 1 \text{ m and } y = 2 \text{ m})$.
2. (a) What do you mean by vibration isolation? Explain the different types. 10
- (b) What is the meaning of tilt and shift in relation to well foundation? How would you control them in sinking of wells? 15
- (c) A retaining wall 8 m high retains sand with angle of internal friction 30° and unit weight 24 kN/m^3 up to a depth of 4 m from the top. From 4 m to 8 m, material is cohesive soil with cohesion 20 kN/m^2 and angle of internal friction 20° . Unit weight of cohesive soil is 18 kN/m^3 . A uniform surcharge of 100 kN/m^2 acts on the top of soil. Determine the total lateral pressure acting on the wall and its point of application. 15

- (c) A hydraulic jump occurs in a 0.5 m wide rectangular channel and the depth of water flow is 0.15 m before the jump and Froude number is 2.5. Make calculations for the specific energy, critical and sequent depths. 15
10. Answer any four of the following : 10×4=40
- (a) Describe flow nets.
- (b) Explain different types of similarities in model study.
- (c) Derive the equation for discharge between two fixed parallel plates.
- (d) Explain boundary layer concept.
- (e) Define and explain hydraulic grade line and total energy line.
- (f) Derive gradually varied flow equation and write the assumptions made.

8. (a) Derive Bernoulli's equation and write the assumptions made in deriving it. 10
- (b) A pipeline carrying oil of sp. gr. 0.87 changes in diameter from 200 mm at a position *A* to 500 mm at another position *B* which is 4 m at a higher level than *A*. If *A* and *B* are at pressures 1 bar and 0.6 bar respectively, and the discharge is $0.2 \text{ m}^3/\text{s}$, determine the loss of head and direction of flow. $8+7=15$
- (c) A sharp-edged rectangular notch 50 cm broad has been used to measure the discharge estimated to be about 20 L per second. Find the percentage error in computing the discharge that would be introduced by an error of 2 mm in observing the head over the notch. Take $C_d = 0.63$ for the notch. 15

9. (a) Derive Chezy's equation for steady uniform flow in open channel. 10
- (b) A triangular gutter, whose sides make an angle of 60° , conveys water at a uniform depth of 25 cm. If the discharge is $0.04 \text{ m}^3/\text{s}$, work out the bed slope of the trough. Take $C = 52$. 15

12Y-100/23

(Continued)

3. (a) Define coefficient of permeability. Explain the various factors on which permeability of a soil depends. 10
- (b) Soil is to be excavated from a borrow pit which has density of 1.75 gm/cc and water content 12%. The specific gravity of soil particles is 2.7. The soil is compacted so that the water content is 18% and dry density is 1.65 gm/cc . For 1000 cu. m of soil in fill, estimate (i) quantity of soil to be excavated from the pit in cu. m, (ii) amount of water to be added and void's ratio of the soil in borrow pit and fill. 15
- (c) What do you mean by Alterberg limits? How will you determine liquid limit of a soil in the laboratory? 15
4. (a) Design a steel built-up beam with 6.5 m effective span carrying a uniform load of 40 kN/m inclusive of self-weight over the entire span. The overall depth of the beam is restricted to 350 mm. The compression flange of the beam is laterally supported ($f_y = 250 \text{ N/mm}^2$). 20
- (b) Find the shape factor for the Tee-section whose dimensions are
web $\rightarrow 150 \text{ mm} \times 10 \text{ mm}$
flange $\rightarrow 100 \text{ mm} \times 10 \text{ mm}$ 10
- (c) Sketch a gusseted base (plan and elevation) and label its parts. 10

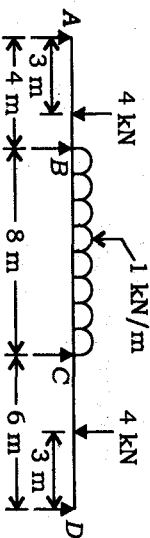
12Y-100/23

(Turn Over)

5. (a) A propped cantilever beam of span l is loaded by a concentrated load W at its mid-point. Using method of consistent deformation, draw the bending moment diagram for the beam.

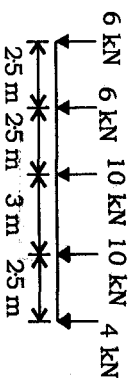
(b) Explain 'stiffness factor' and 'carry-over factor' in connection to moment distribution method of analysis.

(c) A continuous beam ABCD 18 m long is loaded as shown below. During loading, support B sinks by 10 mm. Find support moments.

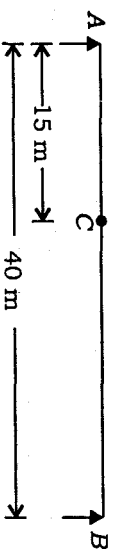


15

6. (a) A system of concentrated loads shown below rolls from left to right across a beam simply supported over a span of 40 m; the 4 kN load is leading. For a section 15 m from the left-hand support, determine (i) the maximum bending moment, (ii) the maximum shear force.



15



12Y-100/23

(Continued)

(b) A two-hinged parabolic arch has a span of 30 m and a central rise of 5 m. Calculate the maximum positive and negative bending moments at a section distant 10 m from the left support, due to a single point load of 10 kN rolling from left to right.

(c) Explain the merits of limit state method of design over working stress method of design of reinforced concrete structures.

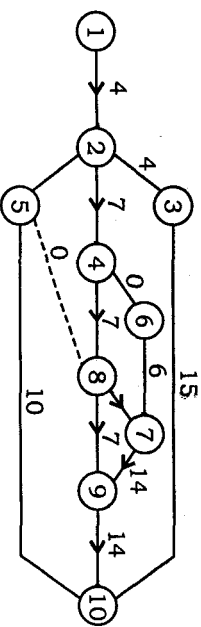
7. (a) Determine the expected completion time, the variance and the critical path for the following project :

Activity	A	B	C	D	E	F	G	H
Predecessors	—	—	A	B	A	C, D	C, D, E	F
Optimistic time (days)	1	1	3	1	1	2	2	6
Most likely time (days)	4	5	6	2	2	4	9	6
Pessimistic time (days)	7	9	9	3	9	6	10	6

20

(b) Determine total, free and independent floats for the following network. Number written on the arrow shows the duration of the activity.

(c) Turn Over



20

12Y-100/23

(Turn Over)

CIVIL ENGINEERING

PAPER—II

Full Marks : 200

Time : 3 hours

The figures in the margin indicate full marks

Candidates should attempt any **two** Sections completely out of **four** Sections—A, B, C and D

SECTION—A

1. (a) Discuss different types of mortar used in brick masonry. 4
- (b) Discuss first class, second class and third class bricks. 8
- (c) What is bond in brickwork? Discuss different types of bonds in brickwork. 8
2. (a) What are the various causes of dampness in building? 6
- (b) Discuss the methods of damp proofing. 8
- (c) What are the ideal characteristics of damp-proofing material? 6
3. (a) What are the advantages of cavity walls? 6
- (b) What are the objects of plastering? 7
- (c) What are the characteristics of an ideal paint? 7

4. (a) What are the fire-resisting properties of common building materials? 10
- (b) What are the general fire safety requirements for buildings? 10
5. (a) How will you determine the setting times of cement in the laboratory? 10
- (b) What are chemical admixtures? Describe briefly the different admixtures used (any three). 10

SECTION—B

6. (a) What are the main recommendations and drawbacks of the NTPC in respect of roads and transports? 10
- (b) Describe the stages involved in preparing a national transport sector plan. 10

7. (a) Define design speed in geometric design. What are the suggested design speeds in India for rural and urban conditions? What is the distinction between ruling and minimum design speeds, and where are they adopted? 10

- (b) Derive, from fundamentals, the equation used for calculating the super-elevation in India, $e = \frac{V^2}{225R}$. 10

19. (a) What are the different types of sewerage system? What are the advantages of each? 10
- (b) Write short notes on the following : 10
- (i) Drop manhole
- (ii) Activated sludge process
20. (a) Explain various methods of disposal of solid waste. 10
- (b) Explain the environmental impact assessment for mines. 10

SECTION—D

16. (a) What do you mean by per capita demand? What are the various factors which affect per capita demand? 10
- (b) What are intakes? Describe a river intake. 10
17. (a) What do you mean by coagulation? Which are the coagulants used and what are the advantages of each? 10
- (b) Design a coagulation-cum-sedimentation tank with continuous flow for a population of 60000 persons with a daily per capita allowance of 120 litres. Make suitable assumptions. 10
18. (a) Explain the following : 10
- (i) Desalination
- (ii) Reverse osmosis
- (b) Explain, with the help of a neat sketch, a pressure filter. What are its advantages over slow sand filter? 10

12Y—100/24

(Continued)

8. (a) What are the considerations in selecting a highway alignment? What special considerations are needed in hilly areas and in desert areas? 10
- (b) What are the stages in highway route location and survey using conventional survey techniques? Describe them. 10
9. (a) Explain the method of flexible pavement design as per IRC (1970). What improvements have been made in IRC Guideline in 1984? 10
- (b) Determine the thickness of a flexible pavement by Burmister's two-layer theory for a wheel load of 40 kN and tyre pressure of 0.5 MN/m². The modulus of elasticity of the pavement material is 120 MN/m² and that of the subgrade is 12 MN/m². The value of F_w for E_1/E_2 of 10 can be taken as under :

Thickness of top layer	F_w
0.5a	0.8
1.0a	0.5
2.0a	0.3

The allowable deflection is 0.5 cm. 10

12Y—100/24

(Turn Over)

10. (a) How is the optimum cycle of signal determined? Describe the size, shape and colour of (i) warning signal, (ii) prohibitory signal, (iii) mandatory signal and (iv) informative signal. 10
- (b) Discuss how highway design can enhance road safety. 10

SECTION—C

11. (a) Explain the unit hydrograph theory. How is a unit hydrograph prepared from an isolated storm? 10
- (b) A 30 cm diameter well penetrates 25 m below the static water table. After 24 hr of pumping at the rate of 5400 L/min, the water level in a test well at 90 m is lowered by 0.53 m and in a well 30 m away, it is lowered by 1.11 m.
- (i) What is the transmissibility of the aquifer?
- (ii) What is the drawdown in the main well? 10
12. (a) Explain any one method of flood routing. 10
- (b) Determine the field capacity of a soil for the following data : 10
- (i) Depth of root zone = 1.8 m
- (ii) Existing moisture = 8%

- (iii) Dry density of soil = 1450 kg/m³
- (iv) Quantity of water applied to the soil = 650 m³
- (v) Water lost due to deep percolation and evaporation = 10%
- (vi) Area to be irrigated = 1000 m²

13. (a) Explain the distribution system for canal irrigation. 10

- (b) Design a regime channel for a discharge of 60 cumecs and silt factor 1.1, using Lacey's theory. 10

14. (a) What are the principal causes and effects of waterlogging in a canal-irrigated land? 10

- (b) Explain Khosla's theory for design of weir on permeable foundation. 10

15. (a) What are rockfill dams and what are their advantages over earthen dams? Draw a neat sketch showing the cross-section of a rock-fill dam. 10

- (b) Write the objectives of river training work. Explain guide banks with neat figure. 10