

Time: 3 hours

Max. Marks: 80

Note:

Q1 is compulsory.

Attempt any three out of the remaining four questions.

Q1. Solve any One out of Two

20 marks each

A Draw the Plans of a **Residential Bungalow**, as (G+1) storied RCC Framed structure with following facilities. (Plot size is 50 m. × 40 m.)

- (i) Living Room = 22 Sq.m.
- (ii) Master's Bedroom (with A.T) = 20 Sq.m.
- (iii) Bed Room = 18 Sq.m.
- (iv) Guest Room = 15 Sq.m.
- (v) Kitchen = 15 Sq.m.
- (vi) Drawing Room = 22 Sq.m.

Provide Toilets, Passages as per Bye-laws. Assume Floor to Floor height as 3.0 m.
Show position of Columns, Doors, Windows & Ventilators in the proposed PLANS.

Draw

(a) **Ground Floor PLAN (with Walls)**

- 15Marks

(b) **First Floor LINE PLAN (Single Line)**

-05 Marks

B Draw the Plans of a **Residential Bungalow**, as (G+1) storied RCC Framed structure with following facilities. (Plot size is 60 m. × 50 m.)

- (vii) Living Room = 24 Sq.m.
- (viii) Master's Bedroom (with A.T) = 22 Sq.m.
- (ix) Bed Room = 16 Sq.m.
- (x) Guest Room = 16 Sq.m.
- (xi) Kitchen = 14 Sq.m.
- (xii) Drawing Room = 20 Sq.m.

Provide Toilets, Passages as per Bye-laws. Assume Floor to Floor height as 3.0 m.
Show position of Columns, Doors, Windows & Ventilators in the proposed PLANS.

Draw

(c) **Ground Floor PLAN (with Walls)**

- 15Marks

(b) **First Floor LINE PLAN (without walls)**

-05 Marks

Q2. Solve any Two out of Three

10 marks each

- A Draw the front elevation of the building as designed and drawn in Q.1.
- B Draw the sectional elevation of the building as designed and drawn in Q.1
- C Explain Principles of Planning of residential buildings in detail.

Q3. Solve any Two out of Three

10 marks each

- A Draw the site plan of the building as designed and drawn in Q1.
- B Draw the Foundation Plan & section of one footing as designed for building in Q1.
- C Write about the Principles of Planning for School building & Procedure for Planning a small School in a Rural area.

Q4. Solve any Two out of Three

10 marks each

- A What are the different types of staircases? Explain all types of staircases in detail along with suitable diagram(s). (with neat sketches)
- B What are the different types of foundations? Explain all with neat sketches.
Draw the One-point perspective of a clubhouse of size (20 x 12) m. Take floor to floor height as 3 m, plinth height at 450 mm, height of parapet wall at roof level as 1.2 m and height of observer as 1.7 m. Assume all other suitable data, for drawing.
- C

Q5. Attempt the following

10 marks each

- A Write about the Principles of Planning for Hospital building & Procedure for Planning a small Primary Health Center in a Rural area.
- B Explain about all PITCHED ROOFS with neat sketches.

Q6. Write Short Notes on any Four out of Six

05 marks each

- A Sun-Path/Wind-Rose diagram
B Objectives of town planning
C Rehabilitation of buildings
D Green building
E Computer aided drawing

(3 hours)

(Total marks 80)

- NB:**
- (1) Question No 1 is compulsory
 - (2) Attempt any 3 questions from remaining five questions
 - (3) Figures to the right indicates full marks
 - (4) Draw neat sketches whenever necessary

1. (a) Write diagnostic properties and industrial use of following minerals 10
 - (i) Mineral Hematite
 - (ii) Mineral Amethyst
 - (iii) Mineral corundum
 - (iv) Mineral Calcite
 - (v) Mineral Muscovite
- (b) Explain following in brief with labeled diagram- 10
 - (i) Parched Water table
 - (ii) Mural joints
 - (iii) Conglomerate and breccia
 - (iv) Pedestal rock
 - (v) Batholith
2. (a) Describe erosional and depositional features created by wind and river (two of each). 10
- (b) Explain mineralogical/ Chemical classification of igneous rocks with suitable example. 10
3. (a) What are the internal factors that modifies surficial features on Earth? Explain various landforms associated with three types of plate boundary. 10
- (b) A coal bearing rock horizon is exposed on horizontal ground, it dips 45° eastward. Width of outcrop is 600 m. Calculate true thickness and vertical thickness of rock horizon. 06
- (c) What is stratigraphy? Explain laws of stratigraphy. 04
4. (a) Explain classification of fold on the basis on position of axial plane. What are the engineering consideration of folds on construction site. 10
- (b) Classify the rocks according to Geomechanics classification for a Rock having UCS of 260 Mpa and RQD of 75% with average spacing of discontinuity of 300 mm, which is slightly rough in nature and highly weathered. The Strike is perpendicular to the tunnel axis and drive with dips is 45° . Also 8 lit/min groundwater inflows the tunnel length per 10 m. State the condition of rocks for tunnel construction. (Note: Table containing RMR parameters should be provided to resolve the question) 10

5. (a) What are the water-bearing qualities of rocks? Explain condition of formation of an artisan aquifer. 10

- (b) 10

Sr. No	Length of sample(cm)	Nature of joint	Sr. No	Length of sample(cm)	Nature of joint
1	5	N	11	11	N
2	3	N	12	4	N
3	10	N	13	2	N
4	10	N	14	1	M
5	25	N	15	12	N
6	4	M	16	6	N
7	3	M	17	27	N
8	1	N	18	22	N
9	16	N	19	10	N
10	7	N	20	10	N

Describe direct subsurface geological investigations? Explain core logging? Calculate rock quality designation and core recovery with the above data. Total run is 2 meter.

6. Write short notes on (any four) 20

- (a) Types of metamorphism
- (b) Internal structure of earth as revealed by seismic waves
- (c) Earthquake zones of India
- (d) Chemical and physical weathering
- (e) Thrust fault
- (f) Unconformity

(3 Hours)

Note: 1) Question No.1 is compulsory.

Total Marks: 80

2) Attempt any THREE from the remaining.

3) Figures to the right indicate full marks.

- Q.1**
- A) Find the values of constants a,b,c and d if $f(z) = (x^2 + 2axy + by^2) + i(cx^2 + 2dxy + y^2)$ is analytic 5
- B) Find the Eigen Value of $A^3 - 3A^2$ 5
- Where $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$
- C) Find the Laplace Transform of $t \sin at$ 5
- D) Find the Fourier series expansion for $f(x) = x$ defined in $(-1,1)$ 5
- Q.2**
- A) If $L[f(t)] = \frac{s}{s^2+s+4}$ find $L[e^{-3t}f(2t)]$ 6
- B) Find the Fourier series expansion for $f(x) = x$ defined in $(-\pi, \pi)$ with period 2π 6
- C) Find the analytic function $f(z)$ with the real part $u = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ 8
- Q.3**
- A) Show that the function $u = x^3 - 3xy^2$ is harmonic function. Hence find the corresponding analytic function and harmonic conjugate. 6
- B) A string is stretched and fastened to two points distance L apart motion is started by displacing the string in the form $u = a \sin(\frac{\pi x}{L})$ from which it is released at time $t = 0$. Show that the displacement of a point at a distance X from one end at time t is given by $u(x,t) = a \sin(\frac{\pi x}{L}) \cos(\frac{\pi ct}{L})$ 6
- C) Obtain the Fourier series expansion of $f(x) = |x|$ where $-\pi \leq x \leq \pi$ 8
- Q.4**
- A) Find Laplace transform of $e^{-4t} \int_0^t u \sin 3u \, du$ 6
- B) Find Inverse Laplace transform of $\frac{2s+3}{s^2+2s+2}$ 6
- C) Verify Cayley – Hamilton theorem for the matrix A and hence find A^{-1} & A^4 8
- where $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$
- Q.5**
- A) Solve by Crank-Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - 16 \frac{\partial u}{\partial t} = 0, 0 \leq x \leq 1$ subject to the condition $u(0,t) = 0, u(1,t) = 100t, u(x,0) = 0, h = \frac{1}{4}$ for one –time step. 6
- B) Find the inverse Laplace transform of $\log \left(\frac{s+a}{s+b} \right)$ 6
- C) Show that the matrix $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 7 \end{bmatrix}$ is diagonalizable. 8
- Find transforming matrix and diagonal Matrix.
- Q.6**
- A) Evaluate $\int_0^\infty e^{-3t} t \sin t \, dt$ using Laplace transform. 6
- B) Find the solution $u_t = u_{xx}$ subject to $u(0,t) = 0, u(5,t) = 0, u(x,0) = x^2(25 - x^2)$ using Schmidt method taking $h = 1$ up to 3 seconds. 6
- C) Find the inverse Laplace transform of $\frac{s}{(s^2+1)^2}$ using convolution theorem. 8
