Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER- VII EXAMINATION-SUMMER 2023

Subject Code: 3170620 Date: 19/06/2023

Subject Name: Computational Geotechnics

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Enlist various linear and non-linear methods. Explain Newton-Raphson method with suitable example.	**03**
	(b)	Explain concept of Finite Element method. Give its applications in geotechnical engineering.	**04**
	(c)	Solve the following system by Gauss Seidal method correct up to 3 decimal places. (Use $X_0=3$, $Y_0=3$ & $Z_0=2$) $2x + y + 54z = 110$ $27x + 6y - z = 85$	**07**
Q.2	**(a)**	Find negative roots of $x^3-7x + 3 = 0$ by Bisection method up to 3 step.	**03**
	(b)	Explain False Position method with suitable example.	**04**
	(c)	Given that $y=1.3$ when $x = 1$ and $y' = 3x+y$. Use second order Runge-Kutta Method to approximate y when $x = 1.2$, use step size 0.1.	**07**
		OR	
	(c)	Use fourth order Runge-Kutta method to find $y(1.1)$ with $h=0.05$, given that $dy/dx = x - y$, $y(1)=1$.	**07**
Q.3	**(a)**	Give a detail note on DEM for understanding of soil behavior.	**03**
	(b)	Explain following terms: 1. Angle of internal friction 2. Cohesion of soil particle 3. Shear strength of soil 4. Pore water pressure	**04**
	(c)	Explain earth pressure coefficient by help of the theory of Lade-Duncan criterion.	**07**
		OR	
Q.3	**(a)**	What are Dirichlet and Neumann conditions?	**03**
	(b)	Give difference between discrete element method and Finite Element Method.	**04**
	(c)	Describe Mohr- Coulomb's strength theory.	**07**

Q.4	**(a)**	Give difference between discrete modeling versus continuum modeling.	**03**
	(b)	Give the importance of boundary value problems in geotechnical engineering.	**04**
	(c)	What is classical plasticity? Explain general framework of classical plasticity.	**07**
		OR	
Q.4	**(a)**	Explain basic concept of discrete modeling.	**03**
	(b)	Explain concept of Cam clay.	**04**
	(c)	Explain Modified Mohr Coulomb failure theory for shear strength? Draw strength envelop for various type of soil.	**07**
Q.5	**(a)**	Give detail note on one dimensional consolidation.	**03**
	(b)	Distinguish between Compaction and consolidation.	**04**
	(c)	Describe the spring analogy theory for primary consolidation. What are its uses?.	**07**
		OR	
Q.5	**(a)**	Define following terms: 1. Immediate Settlement 2. Primary Consolidation 3. Secondary Consolidation	**03**
	(b)	Explain concept of Finite Element method. Give its applications in geotechnical engineering.	**04**
	(c)	Describe with neat sketch Tri-axial test. What are its merits and de-merits?	**07**

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