Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2022

Subject Code:3170620 Date:10/06/2022

Subject Name:Computational Geotechnics

Time:02:30 PM TO 05:00 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.**

			MARKS
Q.1	**(a)**	Explain Newton-Raphson method with suitable example.	**03**
	(b)	Find a root of the equation $x^3 - 4x = 9$ using the Bisection method in four stages.	**04**
	(c)	Solve the following system by Gauss Jacobi method $6x + y + z = 105$ $4x + 8y + 3z = 155$ $5x + 4y - 10z = 65$	**07**
Q.2	**(a)**	Explain False Position method with suitable example.	**03**
	(b)	Explain Newton's Raphson method with suitable example.	**04**
	(c)	Use the Runge-Kutta method of fourth order to solve $\frac{dy}{dx} = 1 + y^2$ Subject to $y(0) = 0$, find $y(0.2)$ and $y(0.4)$.	**07**
		OR	
	(c)	Use 2nd order Range – Kutta method to find y (0.2), given that $\frac{dy}{dx} = 2x + y$, $y(0) = 1$; (use $h = 0.1$).	**07**
Q.3	**(a)**	Define discrete element method. How it is useful to the geotechnical engineering?	**03**
	(b)	Explain application of FEM method for geotechnical engineering.	**04**
	(c)	Explain Mohr-Coulomb theory.	**07**
		OR	
Q.3	**(a)**	Give difference between discrete modeling versus continuum modeling.	**03**
	(b)	Briefly explain Drucker-Prager theory.	**04**
	(c)	Explain in detail One- dimensional plasticity theory for understanding the behavior of soil.	**07**
Q.4	**(a)**	Explain basic concept of discrete modelling.	**03**
	(b)	Explain Modified Mohr Coulomb failure theory for shear strength? Sketch typical strength envelop for different type of soil.	**04**
	(c)	Explain earth pressure coefficients based upon Lade-Duncan criterion.	**07**
		OR	
Q.4	**(a)**	Explain the flow through porous media.	**03**
	(b)	Briefly explain 1-Dimentional consolidation.	**04**
	(c)	Explain Terzaghi's theory of 1-dimensional consolidation with assumptions.	**07**
Q.5	**(a)**	Give detail explanation on various types of consolidation.	**03**
	(b)	Differentiate between consolidation and compaction.	**04**
	(c)	Explain consolidation mechanism through spring analogy theory.	**07**

OR

Q.5	**(a)**	Explain consolidation in detail.	**03**
	(b)	A saturated clay layer of 4 m thickness takes 2 years for 50% primary consolidation when drained on both sides. Its coefficient of volume change m_v = 1.5 x 10^{-3} m^2/kN. Determine the coefficient of consolidation and coefficient of permeability. Assume γ_w= 10 kN/m^3	**04**
	(c)	Explain tri-axial test with neat sketch.	**07**

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