Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VII (NEW) EXAMINATION – WINTER 2024

Subject Code:3170620 Date:16-12-2024

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)**	Explain the concept of Finite Element Method? Give its applications in Geotechnical engineering.	**03**
	(b)	Differentiate between discrete modeling and continuum modeling.	**04**
	(c)	Find a real root of $\cos x - 3x + 5 = 0$, correct to four decimal places using the false position method	**07**
Q.2	**(a)**	Briefly explain different linear and nonlinear analysis methods.	**03**
	(b)	Explain Bisection method with suitable example.	**04**
	(c)	Use the Runge-Kutta method of order two to integrate $dy/dx = \sin y$ with $y(0) = 1$ from $x = 0$ to 0.5 in steps of $h = 0.1$. Keep four decimal places in the calculations.	**07**
		OR	
	(c)	Using the Runge-Kutta method of order four and with $h = 0.2$ to obtain an approximate solution of $dy/dt = -2ty^2, y(0) = 1$, in the initial $0 \leq t \leq 1$ with $h = 0.2$. The exact value of y is given by $y = 1/1+t^2$. Compute the relative error and the percentage relative error.	**07**
Q.3	**(a)**	Briefly explain soil constitutive model	**03**
	(b)	Differentiate between elastic model and plastic model	**04**
	(c)	Explain Tri-axial test with neat sketch. Also enlist its limitation.	**07**
		OR	
Q.3	**(a)**	Explain the flow through porous media.	**03**
	(b)	List the assumption made in the theory of 1-D consolidation.	**04**
	(c)	Explain in detail One-dimensional plasticity theory for understandingthe behavior of soil.	**07**
Q.4	**(a)**	Briefly explain the applications of numerical solution	**03**
	(b)	Explain Newton-Raphson method with suitable example	**04**
	(c)	Differentiate between Tresca failure theory and Von Mises failure theory for soil?	**07**
		OR	
Q.4	**(a)**	Explain Taylor's series method	**03**
	(b)	Explain Jacobi's methodwith suitable example	**04**
	(c)	Explain theory of Lade-Duncan criterion for earth pressure coefficient.	**07**
Q.5	**(a)**	Explain the ordinary and partial differential equations with suitable example	**03**
	(b)	Explain compression index (Cc) and Swelling index (Cs)	**04**
	(c)	Explain consolidation mechanism through spring analogy theory.	**07**
		OR	
Q.5	**(a)**	What are Disichlet conditions and Neumann conditions?	**03**
	(b)	Write a short note on'Cam clay'	**04**
	(c)	Explain classical plasticity. Explain general framework of it.	**07**

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