

**GLOBAL ACADEMY OF TECHNOLOGY**  
(Autonomous Institution, Affiliated to VTU)  
**First Semester M. Tech. Structural Engineering**  
**20MST161: DESIGN OF SUBSTRUCTURES**

**Time: 3 Hrs.**

**Max. Marks: 100**

- Note: 1. Answer five full questions choosing one from each module.  
2. Assume missing data, if any, suitably.  
3. USE of IS codes 456,291, 4091, 6043 are permitted.*

Q. No.	Questions	Marks
<b>Module 1</b>		
1	a Explain the objectives of soil exploration.	8
	b Discuss about general requirement of foundation.	6
	c Explain the footing on layered soil.	6
<b>OR</b>		
2	a List and explain different types of settlement in shallow foundation.	10
	b Explain in detail, the types of foundations.	10
<b>Module 2</b>		
3	a Discuss the modes of failure in soils for shallow foundation	6
	b Explain in detail, the factors affecting bearing capacity of foundation	8
c	A rectangular column 450mm X 600mm transfers a vertical load of 1000kN, without any moment. The allowable soil pressure is 120kN/m <sup>2</sup> . Design a rectangular footing to support the column.	6
<b>OR</b>		
4	a With neat sketches explain types of raft foundation and also list the situation when raft foundation is preferred.	10
	b Design a trapezoidal footing of beam and slab type for two columns 3m centre to centre. One column is 400x400mm carries 800kN and another is 350x350mm carrying 600kN load. The footing can extend by 200mm beyond both the columns. The allowable bearing pressure for the soil is 160kN/m <sup>2</sup> . (No structural design)	10
<b>Module 3</b>		
5	a Explain the classification of pile foundation.	10
b	Write a note on (i) Laterally loaded piles and (ii) Uplift capacity of piles.	10
<b>OR</b>		
6	Write a short note on any four of following: (i) Negative skin friction (ii) Efficiency of pile group	20

		(iii) Pile load test (iv) Settlement of piles (v) Single loaded pile capacity by static analysis (vi) Group capacity of pile	
<b>Module 4</b>			
7	a	Give a brief note on different types of caisson.	10
	b	What are the components of well foundation? Explain with neat sketches.	6
	c	Which are the forces acting on tower foundation.	4
<b>OR</b>			
8	a	Write a note on sinking of well and explain tilt and shift.	10
	b	How is safety of tower foundation is checked against (i) Uplift and (ii) Overturning.	10
<b>Module 5</b>			
9	a	Give the characteristics of expansive soils. Describe the procedure of their identification.	10
	b	Describe the silent features of under reamed piles. How are their capacities obtained in sand and clay?	10
<b>OR</b>			
10	a	Explain external stability while designing a reinforced earth wall.	10
	b	Explain the general criteria for the design of machine foundation.	10