

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – II • EXAMINATION – WINTER • 2014****Subject code: 1724302****Date: 03-12-2014****Subject Name: Analysis and Design of Foundation Systems****Time: 02:30 pm - 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Use of IS:456 and SP:16 is allowed.
3. Draw neat sketches with detailing.
4. Draw soil pressure distribution diagram where necessary.
5. Make suitable assumptions wherever necessary.
6. Figures to the right indicate full marks.

- Q.1** (a) Define Limit State method for design of reinforced concrete structures. Give various criteria to classify limit state as per IS: 456. **07**
 (b) What is ñShell foundationò? Explain in detail classification and design concepts for it. **07**
- Q.2** Design a slab-beam type strip footing for column C1, C2,C3,C4 of size 350 X 350 mm spaced at 4.0 m centre to centre and column loads are 900, 1300, 1000 and 900 respectively. Width of footing is restrained to 2.0 m. Grade of concrete used is M 20 and reinforcement is Fe 415. SBC=150 kN/m². **14**
- Q.3** Design a rectangular isolated slope footing for a column of size 250mm X 250mm carrying a characteristic axial load of 1800 kN and reinforced with 10 nos. 25mm dia. bars in M30 grade concrete. SBC is 190kN/m² at 2.0 m depth. Use M 20 and Fe 415. **14**
- Q.4** (a) Explain winkler foundation. Give solution for beams resting on elastic foundation. Support your answer showing necessary equation for slope, deflection, moment and shear force. **07**
 (b) Explain the IS criteria for reinforcement curtailment retaining wall. **07**
- Q.5** (a) Design a pile cap for a column 300mm X 300mm in section supported on group of three piles at its centre. The total load transferred to the column is 600kN. Piles are at 1.2 m c/c. Use M20 and Fe 415. **10**
 (b) Explain Under-reamed pile with its load transfer mechanism. **04**
- Q.6** (a) Explain in detail step wise procedure for beams resting on elastic foundation using finite difference method. Show necessary boundary conditions. **07**
 (b) Find length of pile (300mm dia.) in sandy clay required to support a load of 200kN. Properties of soil are: F.S = 4, $\mu=0.35$, $\bar{u} = 30^\circ$, $\gamma = 18 \text{ kN/m}^3$. **07**
- Q.7** Design only stem of a counterfort retaining wall with necessary stability checks to retain a soil of height 6.5 m above ground level. Take $\gamma_b = 18 \text{ kN/m}^3$, SBC = 200 kN/m², $\bar{u} = 32^\circ$, $\mu=0.55$, $f_{ck}=20 \text{ MPa}$ and $f_y = 415 \text{ MPa}$. **14**
