

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT  
TEST -3 EXAMINATION- 2023

B.Tech-I Semester (CSE/IT/ECE/CE/BT/BI)

COURSE CODE (CREDITS): 18B11CE514

MAX. MARKS: 35

COURSE NAME: Foundation Engineering

COURSE INSTRUCTORS: Prof. Ashok Kumar Gupta

MAX. TIME: 2 Hours

*Note: (a) All questions are compulsory.*

*(b) Marks are indicated against each question in square brackets.*

*(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems*

1. A raft foundation has to be supported by a group of concrete piles. The gross load to be carried by the pile group is 250 t, inclusive of the weight of the pile cap. The subsoil consists of a 25 m thick stratum of normally consolidated clay having an unconfined compressive strength of  $4.8 \text{ t/m}^2$  and an effective unit weight of  $0.9 \text{ t/m}^3$ . Design the pile group with a factor of safety of 3 against shear failure. [6]
2. Determine the safe load that can be carried by a pile having gross weight of 1.5 t, using the modified Hiley's formula. Given  
Weight of hammer = 2.0 t  
Height of free fall = 91 cm  
Hammer efficiency = 75%  
Average penetration under the last 5 blows = 10 mm  
Length of pile = 22 m  
Diameter of pile = 300 mm  
Co-efficient of restitution = 0.55 [6]
3. A concrete pile 45 cm in diameter and 15 m long driven into a homogeneous mass of clay soil of medium consistency. The water table is at ground surface. The unit cohesion of the soil under undrained condition is  $50 \text{ kN/m}^2$  and the average unit weight of the soil is  $18 \text{ kN/m}^3$ . Take adhesion factor  $\alpha = 0.75$ . Use  $\lambda$  - method to determine the skin friction. Compute  $Q_u$  and  $Q_a$  with FOS = 2.5. [6]
4. Determine the natural frequency of a machine foundation having a base area  $2\text{m} \times 2\text{m}$  and mass 15 Kg including mass of machine. Take  $c_u = 4 \times 10^7 \text{ kN/m}^3$ . [4]
5. Determine coefficient of uniform compression if a vibration test on a block  $1\text{m} \times 1\text{m} \times 1\text{m}$  gave resonance frequency of  $30\text{Hz}$  in the vertical direction. Mass of oscillator used was 60 Kg. [4]
6. A cyclic plate load test was carried out on a deposit of silty sand to estimate the elastic coefficients for the design of a compressor foundation. The test was carried out at a depth of 3m, using a  $30\text{cm} \times 30\text{cm}$  test plate. The data obtained was:

Load intensity, kN/m <sup>2</sup>	25	0	50	0	75	0	100	0	150	0	200	0	250	0
Settlement, mm	0.50	0.40	0.95	0.80	1.60	1.25	2.50	1.90	3.60	2.60	4.80	3.80	6.70	4.90

Determine the value of  $C_u$ ,  $C_\epsilon$  &  $C_\phi$  for 10m<sup>2</sup> base area.

[9]