Registration no: | | | | | | | | | | |

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M.TECH
CEPE205

2nd Semester Back Examination – 2016-17
SOIL DYNAMICS AND GEOTECHNICAL EARTHQUAKE ENGINEERING
Branch: STRUCTURAL & FOUNDATION ENGG, STRUCTURAL ENGG
Time: 3 Hours
Max Marks: 70
Q.CODE:Z848

Answer Question No.1 which is compulsory and any five from the rest.
The figures in the right hand margin indicate marks. Assume suitable data wherever necessary

Q 1 **Answer the following questions:** **(2 x 10)**

a) Show the relationship between dynamic shear modulus and shear wave velocity and mass density of a soil.
b) What do you mean by degrees of freedom? Sketch a system with multi degrees of freedom.
c) What is a Tsunami? How does it occur?
d) Sketch and discuss the body waves.
e) What do you mean by 'damping ratio' and 'critical damping coefficient'?
f) Differentiate between focus and epicenter.
g) Differentiate between surface wave magnitude and moment magnitude.
h) What is the difference between up-hole and down-hole tests?
i) List various approaches to determine the liquefaction potential of a soil. What is 'state parameter'?
j) What is permeation grouting?

Q 2 List various dynamic properties of soil. Enumerate various small strain and large strain field and laboratory tests to determine these properties. Discuss the cyclic triaxial test in detail. How do you obtain the hysteresis loops from this test? How these loops are used for determining the dynamic properties of soils? **(10)**

Q 3 a) What is an earthquake? How does it occur? Discuss various theories. **(5)**
b) The mass density of a soil deposit is 2.83 gm/cc. The P-waves and the S-waves travel at a velocity of 6.4 Km/sec and 3.0 Km/sec respectively through the soil. Estimate the bulk modulus and the shear modulus of the soil and hence the Poisson's ratio. **(5)**

Q 4 (a) List various types of earthquake magnitude. Discuss how they are estimated with numerical expressions. **(5)**
(b) Discuss how the earthquake energy is estimated during an earthquake. How is it related to the seismic moment? Discuss. **(5)**

Q 5 (a) A seismic refraction survey shows the p-wave arrival times at the geophones as listed below in Table: 1. **(5)**

Table: 1

Geophone	Distance from Shot Point (m)	p-wave arrival time (micro second)
A	0	0
B	5	11
C	10	26
D	20	49
E	40	65
F	60	71
G	80	76
H	100	83
I	120	88

(b) Show the difference between 'flow liquefaction' and 'cyclic mobility'. When do these occur? Discuss the parameters influencing the liquefaction susceptibility of a soil deposit. **(5)**

Q 6 a) Discuss the cyclic stress approach of evaluation of liquefaction potential of a soil. **(5)**

b) A uniform deposit of sand occurs up to a great depth. The observed N values are 21. The water table occurs at the ground surface. Assuming unit weight of saturated soil to be 18.58 kN/m^3, estimate if liquefaction occurs at this site for an earthquake of magnitude 7.6. **(5)**

Q7 (a) Discuss various approaches to estimate the seismic bearing capacity of both cohesive and cohesionless soils with neat sketches and calculations. **(5)**

(b) A load of 150 kN/m is being transferred from the building to an underlying footing of width 2 m which rests on a cohesionless soil deposit having submerged unit weight = 9.8 kN/m^3, angle of internal friction = 32^0 and pore pressure ratio = 0.21. If N_γ = 20, find the factor of safety against failure. **(5)**

Q8 **Write brief notes on any FIVE** **(5 x 2)**

a) Jet Grouting
b) Stone columns
c) Base isolation
d) Bender element test
e) Dialatometer Index
f) Zone of liquefaction
g) Youd's model
h) Critical void ratio