Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

Course: Rock Mechanics and Geotechnical Engineering (GNEG-391) **Semester: V**
Programme: B-Tech GIE and GSE V
Time: 03 hrs. **Max. Marks: 100**
Instructions: All the question are compulsory wherever necessary draw neat sketch
Number of Pages :03

SECTION A

S. No.		Marks	CO
Q 1	Write a short note on the following terms. a) Colluvium soil b) Hardpan c) Thermal Admittance d) Q-system e) SRF	**10**	**CO1**
Q.2	Differentiate between the following terms. i) Cohesive soil and Non-cohesive soil ii) Effective porosity and Total porosity iii) Clogging and Dilation iv) Effective stress and Shear stress v) Volumetric strain and Shear strain	**10**	**CO2**

SECTION B

Q .3	Define Liquefaction? Explain in brief causes, effect and prevention of liquefaction during geotechnical engineering.	**10**	**CO3**
Q.4	Explain in brief different types of Blasting and control techniques used during Geotechnical engineering. Explain their significance.	**7+3**	**CO4**
Q.5	a)Describe in brief specific requirements of excavation b) Write a short note on excavation methods and excavation hazards during geotechnical Engineering.	**3+7**	**CO4**
Q.6	a) Explain and justify different type of rock material properties during rock mass and rock structure rating. **OR** i)In a borehole length of 200 cm the recovery core lengths (cm) are 43, 8, 6, 20, 17, 38, 10, 11, 9, 3, 20 and 15. Find the rock quality designation. ii) A 15 m span crusher chamber for an underground mine is to be excavated at a depth of 2,100 m below surface. RQD values range from 85% to 95%. Joint set number is 4 while joint roughness number is 3 and joint alteration number is 1 also joint water reduction factor is 1. SRF should	**10**	**CO4** **CO5**

	lie between 10 and 20. Find Rock tunneling quality.		
	SECTION-C		
Q .7	**1.** It has been determined that a point in a load-carrying chamber is subjected to the following stress condition: σ_x = 400 MPa σ_y = -300 MPa τ_{xy} = 200 MPa (CW) Calculate the following: (i) maximum and minimum principal stress and maximum shear stress (ii) angle of orientation of stresses (iii) Draw the initial stress element and the complete Mohr's circle, labeling critical points. 2.A sample of clay taken from a natural stratum was found to be partially saturated and when tested in the laboratory gave the following results. Compute the degree of saturation. Specific gravity of soil particles = 2.6; wet weight of sample = 2.50 N; dry weight of sample = 2.10 N; and volume of sample = 150 cm^3.	**14+6**	**CO5**
Q.8	a) 4.0m γ= 17.0 kN/m2 8.0m **A 1.5** γ= 18.5 kN/m2 Sandy silt stone C'=15 kpa, $\Phi'=28^{0}$, K= 0.35 The series of shear strength test performed on above said lithology and calculated values are show in the figure. Determine the shear strength on horizontal and vertical planes at point **A** for above given values. b) In the quarry cylindrical limestone slab was cut and measured length is 3m and 0.4m diameter. It Carries a Load of 60 MN. Given that, the modulus of elasticity is 100 GPA**.** Calculate the compressive stress and strain and also determine how much the limestone slab is compressed. c)From the below figure find the effective stress in the soil at a depth of 4m below the footing and the increase in the stress due to a drop of the WT (wall thickness) from originally 1m below the footing to 5m below the footing. I_4 = 0.086	**8+5+7**	**CO5** **CO6**

OR

c. A cylindrical core of diameter 54 mm and height of 150 mm was taken for unconfined compressive strength test. The test results are tabulated below. Draw stress strain graph and determine the compressive strength, Elastic modulus and Poisson's ratio of the sample. **(10+10)** **CO5 CO6**

Load(kN)	Axial Displacement(mm)	Lateral displacement(mm)
227.1	0.26	0.014
293.5	0.3	0.053
376.7	0.34	0.014
391.4	0.35	0.029
415.5	0.38	0.048
414	0.42	0.054

d. Calculate the vertical stress for given depth **Z = 10m** under the center of Raft **10m X 10m** for foundation with uniform Load **Q = 50 ton/m^2**.

Table: 1 Influence Factors (I_p) for Foundation Engineering used in vertical stress calculation:

R/Z	Corner	Centre	Intermediate
0.1	0.067	0.064	0.100
0.2	0.133	0.128	0.200
0.3	0.200	0.192	0.300
0.4	0.267	0.256	0.400
0.5	0.333	0.32	0.500
0.6	0.400	0.384	0.600
0.7	0.467	0.448	0.700
0.8	0.533	0.512	0.800
0.9	0.600	0.576	0.900
1.0	0.667	0.64	1.000
1.25	1.00	0.82	1.023
1.50	1.23	0.95	1.035
1.75	1.45	1.00	1.052

	2.0	1.76	1.07	1.073		