Name:		
Enrolment No:		



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

Course: ROCK MECHANICS Course Code: (GSEG 324) Semester: V Programme: B.TECH. IN MINING ENGG. (Indian) Time: 03 hrs.

Max. Marks: 100

Instructions: Answers must be brief and to the point.

SECTION A: 20 MARKS

		Marks	CO
Q1. a)	Statement: Unsupported excavations are Principal stress plane, justify.	[4]	CO1
b)	Identify the different strain rosette.	[4]	CO1
c)	Explain FOUR time-dependency effects on rock.	[4]	CO2
d)	What are the different stabilization principles? Differentiate stabilization methods.	[4]	CO4
e)	Evaluate challenges in hydraulic fracturing method?	[4]	CO6
	SECTION B: 40 MARKS		
Q2. a)	Explain the Hoek-Brown failure criteria.	[6+4]	CO2
<u>b)</u>	Discuss the environmental effects on rock.	[0.1]	
Q3. a)	What are the differences of RMR and Q-system of rock classification?		CO3
Q4. a)	How JRC and JCS are estimated in the field in relation to rock discontinuity? Examine the various factors responsible for Subsidence.		
(4. a) b)	What is role of Point of Inflection in subsidence study?		CO ₅
Q5. a)	Illustrate the three aspects of excavation.	16.47	GO 4
b)	How the stress-strain graph is interpreted with the excavation surface?	[6+4]	CO4
	OR		
Q6. a)	What are the geotechnical consequences of Excavation.	[6+4]	CO4
b)	What are the concepts of stability for transitional rock masses?	[0.1]	
	SECTION-C: : 40 MARKS		
Q7. a)	Briefly explain ground response curve for different method of excavation.	[5]	CO4
b)	Determine and Construct the subsidence for a full-width of excavation based on the		
	following information: Width of excavation=150m, depth=500m, seam thickness=1.5m,		
	subsidence factor=0.40, the excavation is horizontal with critical width of excavation.		
	S/S _{max} 0 0.05 0.1 0.2 0.4 0.6 0.8 1.0		
	Distances from the panel centre in terms of depth		
	w/h 0.90 0.59 0.47 0.34 0.24 0.18 0.12 0	[5,10]	COF
Q8. a)	Discuss the Rock reinforcement in continuous rock.	[5+10]	CO5
Qo. a)	Discuss the Nock Tellhorcement in Continuous Tock.	[5]	UU4

b)) What are the different components of subsidence? How the components will vary at		
	Point of Inflection?	[7]	CO5
c)	Write down the assumptions needed to open a circular opening in massive rock.	[8]	CO6
	OR		
Q9. a)	Discuss how the support is chosen based on ground response curve.	[5]	CO4
b)	Discuss Principal of Superposition and Principal of Equivalence.	[5]	CO5
c)	Discuss the inter-dependency of rock structure, in-situ stress and water condition of rock	[7]	CO6
	mechanics concepts	[8]	

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Q6. a)

b)

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Morks CO

[6+4]

CO4

Max. Marks: 100

S No Statement of the Questions

Instructions: Answers must be brief and to the point.

Discuss the various effects of Excavation.

What are the concepts of stability for transitional rock masses?

SECTION A: 20 MARKS (ANSWER ALL)

5. NO.	Statement of the Questions	Marks	CO
Q1. a)	Write the features of Mohr's circle.	[4]	CO1
b)	How the size of rock affect during in intact rock testing.	[4]	CO1
c)	Explain various environmental effects on rock.	[4]	CO2
d)	What are the different stabilization principles? Differentiate them.	[4]	CO4
e)	Compare Flatjack and Hydraulic fracturing method.	[4]	CO6
	SECTION B: 40 MARKS (ANSWER 2, 3, 4 AND EITHER 5 OR 6)		
Q2. a)	Discuss the loading conditions in rock testing.	[6+4]	CO2
b)	Distinguish between Mohr-Coulomb and Hoek-Brown failure criteria.	[UT4]	COZ
Q3. a)	Discuss the RMR system of rock classification.		
b)	What is scale effect of rock?	[6+4]	CO ₃
Q4. a)	Discuss the FIVE components of Subsidence.		
b)	Write the Profile function and elaborate.	[5+5]	CO ₅
Q5. a)	Discuss the three aspects of excavation.		
b)	How the stress-strain graph is correlated with the excavation?	[6+4]	CO4
	OR		

	SECTION-C: : 40 MARKS (ANSWER 7 AND EITHER 8 OR 9)			
Q7. a)	Given: $\sigma_x = 20$ MPa, $\sigma_y = 10$ MPa, $\tau_{xy} = 10$ MPa, $\tau_{yx} = 10$ MPa, $\theta = 20^\circ$ rotation in clockwise direction. Calculate the values of stresses after rotation. Calculate the principal stresses and principal stress directions. Draw the Mohr's circle on graph paper Discuss ANY FIVE properties of the discontinuities	[5] [5] [5]	CO1	
Q8. a)	Write ANY SIX properties of the discontinuities.	[6]	CO4	
b)	Explain the different factors for subsidence.	[7]	CO5	
(c)	Discuss hydraulic fracturing method briefly. What are the problems with this method?	[7]	CO6	
	OR			
Q9. a)	Discuss the how the support is chosen based on ground response curve.	[6]	CO4	
b)	Explain Principal of Superposition and Principal of Equivalence.	[7]	CO5	
c)	Elaborate effect of a single discontinuity on the state of stress and stress direction.	[7]	CO6	