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

Course: Power System Protection and switchgear (PSEG 312) **Semester: VI**
Program: B.Tech EL & PSE
Time: 03 hrs.   **Max. Marks: 100**
Instructions: All questions are compulsory in section A and section B.
Attempt any two in section C

SECTION A

S. No.		Marks	CO
Q 1	Calculate the PSM suitable for a relay setting of 150%, if the fault current is 1500 A. The CT ratio is 150/5. Also, determine the time of operation of the relay corresponding to the PSM. If the time setting dial is set at 0.2 and the time operation of the relay when set at 1.0 is 1.56 sec.	5	CO1
Q 2	Describe the effect of Arc Resistance on the performance of different types of distance relay.	5	CO2
Q 3	The short circuit current of a 132 kV system is 8000 A. The current chopping occurs at 2.5% of peak value of the current. Calculate the prospective value of the voltage which will appear across the contacts of the circuit breakers. The value of the stray capacitance to the earth is 100 pF and L=30 H.	5	CO4
Q 4.	Describe the working of definite time overcurrent relay with the help of block diagram.	5	CO3

SECTION B

Q 5.	Describe the construction and operation of the HRC cartridge fuse. Also, List down the points that should be considered while selecting a fuse.	10	CO5
Q 6.	Explain the phenomenon of current chopping in a circuit breaker with waveform. What measures are taken to reduce it?	10	CO4
Q7.	(a) Discuss how the making and breaking capacity of a circuit breaker are tested in a lab type testing station.	5	CO5
	(b) A generator is provided with restricted earth fault protection. The ratings are 11 kV, 2500 kVA. The percentage of winding protected against phase to ground fault is 84%. The relay setting such that it trips for 30% out of balance. Calculate the resistance to be added in neutral to ground connection.	5	CO3
Q 8.	(a) Illustrate the various protection schemes employed for motor.	5	CO2,
	(b) Explain prospective current peak, prospective current, cut off current, pre-arching time and arching time. Also draw the cut off characteristics of Fuse.	5	CO4

SECTION-C

Q 9.	(a) Explain the term: Restriking voltage, RRRV and recovery voltage with the help of waveform. Derive the expression for critical resistance for no	14	CO4

		transient oscillation.		
	(b)	In a 132 kV system, reactance and capacitance upto the location of the circuit breaker is 5 ohm and 0.02 microfarad respectively. A resistance of 500 ohm is connected across the break of the circuit breaker. Determine (i) natural frequency of oscillation (ii) damped frequency and (iii) value of critical resistance.	6	CO4
Q10.	(a)	Describe with neat sketches the working of the vacuum circuit breaker. Compare its merits and demerits with SF6 circuit breaker.	14	CO5
	(b)	Following observations were achieved on a single frequency transient during short circuit test on a circuit breaker: Time to reach the peak restriking voltage=40 ms Peak restriking Voltage= 100 kV Calculate (i) average RRRV (ii) frequency of oscillations.	6	CO4
Q 11.	(a)	Discuss with neat diagram, the problem associated with the arc interruption of (i) low inductive current (ii) capacitive current.	10	CO2
	(b)	Discuss how (i) an electromagnetic relay is realized. Explain its characteristics on R-X diagram. Is it a directional relay with straight line characteristics?	10	CO3