Ref. No. : Ex/EE/5/T/422/2018

B.E. ELECTRICAL ENGINEERING (PART TIME) FOURTH YEAR SECOND SEMESTER - 2018

SUBJECT: - POWER SYSTEM PROTECTION & SWITCHGEAR

Full Marks: 100

Time: Three hours (50 marks for this part)

Use a separate Answer-Script for each part

No. of Questions		PART -I Answer any Three (Two marks reserved for well organized answers)	Marks
1)	a)	Draw a typical sketch for trip coil current, fault current, voltage between fixed contact and moving contact, and travel records of a circuit breaker while opening to clear a fault. Also define opening and arcing time.	(10)
	b)	Briefly explain the two conditions that the switching devices must comply with in order to effect disconnection.	(6)
2)	a)	What is active recovery voltage? Explain the effects of various operating conditions on active recovery voltage? Deduce the expression for Rate of Rise of Restriking Voltage.	(10)
	b)	Briefly explain why static characteristic of arc is different from its dynamic characteristic?	(6)
3)	a)	In a short circuit test with earthed neutral, on a 132KV, three phase, circuit breaker, the power factor of the fault was 0.3, the recovery voltage was 0.95 of full line voltage, the breaking current was symmetrical and the restriking transient had a natural frequency of 16KHz. Estimate the rate of rise of restriking voltage, assume the fault is grounded.	(8)
	b)	Explain resistance switching in circuit breakers.	(8)
4)	a)	With the help of relevant diagrams explain current chopping phenomenon in circuit breakers.	(8)
	b)	Explain the current interruption phenomenon in a SF_6 circuit breaker.	(8)
5)		Write short notes: (any two) (i) With necessary derivation show how to connect the sequence networks to stimulate S-L-G fault. (ii) Desirable properties of the contact materials to be used in vacuum circuit breakers. (iii) Advantages of using SF_6 gas as an arc interrupting medium in circuit breakers. (iv) Air Break Circuit Breakers.	(8×2)

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BACHELOR OF ELECTRICAL ENGINEERING
(EVENING)EXAMINATION, 2018

(4TH Year, 2nd Semester)

POWER SYSTEM PROTECTION &SWITCHGEAR

PART-II

Answer any 3 questions

(2 marks reserved for neatness)

Q1.(a)Draw a single phasing preventer circuit for 3 phase induction motors using negative sequence filter and explain its working. 6 marks

(b)Explain any carrier assisted distance protection scheme for the protection of transmission lines. 10 marks

Q2.(a)Explain restricted earth fault protection of transformers. 8 marks

(b)Determine the time of operation of a 5A, 3sec overcurrent relay having a current setting of 125% and a time setting multiplier of 0.6 connected to a supply circuit through a 400/5 CT when the circuit carries a fault current of 4000A.(Characteristic gives operating time of 3.5 sec for PSM of 8 and TSM 0.6) 8 marks

Q3. (a)What are the advantages of solid state relays? 6 marks

(b)Derive the Universal Relay torque equation. 10 marks

Q4. (a)Draw the characteristics of Plain,Reactance,Mho type impedance type distance relays in the RX plane. 6 marks

(b)Explain in details the realization of a Mho relay. 10 marks

Q5. (a)Draw the functional block diagram of a digital relay. 6 marks

(b)A star connected 3 phase, 10MVA, 6.6KV alternator has a per phase reactance of 10%.It is protected by the Merz price circulating current principle which is set to operate for fault currents not less than 175 A.Calculate the value of the earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected. 10 marks

END