BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING) FOURTH YEAR SECOND SEMESTER SUPPLEMENTARY EXAM 2023
SUB: POWER SYSTEM PROTECTION AND SWITCHGEAR

Time: Three hours   Full Marks: 100

(50 marks for each part)
Use a separate answer script for each part.
PART I
Figures in the margin indicate full marks

	Group –A Answer **any three** questions from **Group A**	
1.	Explain the sensitivity property and selectivity property of a power system protective relay. Also briefly discuss 'Primary' and 'Back up' relay with respect to power system protective relaying.	(2+8) =10
2.	Discuss the special feature of the IDMTL relay for feeder protection. Explain the terms 'PS', 'PSM', and 'TMS'.	(6+4) =10
3.	Explain 3-step 3-zone distance protection. Briefly discuss the reactance relay and mho relay.	(5+5) =10
4.	With the help of a neat diagram explain how directional overcurrent relays protect ring main feeders. Discuss briefly the construction of directional type overcurrent relay.	(6+4) =10
5.	a) A 1 Amp IDMTL relay with its plug set at 50 % is carrying a fault current of 1000 A. The C.T. ratio is 200/1 Amp. Find the P.S.M of the relay. b) Why do the plug settings for an earth fault relay vary between 10% to around 70%? What are the advantages of using earth fault relays over overcurrent relays for the detection of phase-to-ground faults?	(2) (4+4)
	Group –B Answer **any two** questions from **Group B**	
6.	Discuss why a biased differential relay is used in power system protection instead of an ordinary differential relay. Explain the operating principle of such a relay. Draw the characteristics curve also.	(4+6) =10
7.	With the necessary connection diagram and derivation explain how the current transformers on the two sides of a star-delta transformer should be connected to avoid spurious tripping. Also, explain why the harmonic restraint feature is necessary for transformer differential relays.	(6+4) =10
8.	Discuss how loss of excitation protection is carried out for an alternator. Also, explain how loss of synchronism protection is provided for an alternator.	(6+4) =10
9.	With the necessary trip circuit explain the Blocking scheme in Carrier Aided Distance Protection.	10
10.	Discuss about Buchholz relay for transformer protection.	10

BACHELOR OF ENGINEERING (ELECTRICAL ENGINEERING)4TH YEAR, 2ND SEMESTER
SUPPLEMENTARY EXAM 2023
SUBJECT: - POWER SYSTEM PROTECTION & SWITCHGEAR

Time: Three hours   (50 marks for this part)   Full Marks: 100
Use a separate Answer-Script for each part
PART -II   **Marks**
Answer any Three
(Two marks reserved for well organized answers)

1.(a)   Draw and discuss the concept of a typical switchgear.   (8)

(b)   With respect to the operation of a circuit breaker, briefly discuss   (8)
(i) contact erosion, (ii) opening speed, (iii) closing speed and (iv) making time

2.(a)   Draw and discuss the external characteristic of the arc produced in the circuit breaker.   (10)

(b)   A circuit breaker has a critical arc length of 18cm and its speed of contact separation is 6m/sec. If the voltage drop per cm. of arc length is 650 volts, when interrupting 15kA, calculate the arc energy liberated in kW-s.   (6)

3.(a)   In regard to an electric arc explain thermionic emission and field emission. Also explain how elastic collisions and non-elastic collisions help to maintain the electric arc.   (10)

(b)   State the opposing forces which the circuit breakers have to overcome during opening operation.   (6)

4.(a)   Draw and explain the characteristic of sudden short circuit fault current for series R-L circuit.   (10)

(b)   Explain the terms 'restriking voltage' and 'RRRV'.   (6)

5.(a)   Describe the effect of different operating conditions on active recovery voltage in a CB.   (10)

(b)   What are the advantages and disadvantages of oil circuit breakers?   (6)