Code No: 117HX **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech IV Year I Semester Examinations, January/February - 2023
SWITCH GEAR AND PROTECTION
(Electrical and Electronics Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: i) Question paper consists of Part A, Part B.
ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.
iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

PART – A

(25 Marks)

1.a)	Define switchgear.	[2]
b)	Mention the detail of circuit breaker rating.	[3]
c)	List out the classifications of Relays.	[2]
d)	Give the applications of Distance relays.	[3]
e)	Illustrate about stator and rotor faults of generator.	[2]
f)	What is magnetic inrush current?	[3]
g)	Explain the protection of parallel feeder.	[2]
h)	What are the effects of ungrounded neutral on system performance?	[3]
i)	List different types of surge arresters.	[2]
j)	Why is lightning accompanied by a thunder?	[3]

PART – B

(50 Marks)

2.a) Derive the expressions for Restriking voltage, Recovery voltage, Rate of rise of restriking voltage (RRRV) and Average rate of rise of restriking voltage, (ARRRV) of a circuit breaker.

b) A circuit breaker interrupts the magnetizing current of a 100 MVA transformer at 220kV. The magnetizing current of the transformer is 9% of the full load current. Determine the maximum voltage which may appear across the gap of the breaker when the magnetizing current is interrupted at 70% of its peak value. The stray capacitance is 3550 μF. The inductance is 50 H. [5+5]

OR

3. Explain the construction and principle of operation of vacuum circuit breaker with neat sketch. [10]

4.a) What are the functional characteristic of protective relays?
b) Explain the Operation principle and characteristics of MHO relay. [5+5]

OR

5. Show that the torque on the disc of an induction disc relay is maximum when the phase difference between the two fluxes is 90^0. Indicate the direction of rotation of the disc with reference to the fluxes under the poles. [10]

6.a) Explain the percentage differential protection scheme used for Generators.

b) A 3-phase, 33/ 6.6 kV star-delta connected transformer is protected by Merz-piece protection scheme. The CTs on the LT side have a ratio of 400/5 amps. Find the ratio of CTs on the HT side. [5+5]

OR

7. What is Buchholz relay? Discuss its working principle? For what types of faults is it employed? [10]

8.a) Explain about translay relay.

b) Discuss about arcing grounds and grounding practices. [5+5]

OR

9.a) Explain 3-zone distance protection of a transmission line.

b) A 110 kV, 3-phase 50Hz, 125 km, overhead line has a capacitance to earth of 0.06 μF / km/ phase. Calculate the inductance and MVA rating of the Peterson coil used for earthing the above system. [5+5]

10.a) What are the causes of over voltages arising on a power system? Why is it necessary to protect the lines and other equipment of the power systemagainst over voltages?

b) Explain Zinc oxide lightning arresters along with V-I characteristics [5+5]

OR

11.a) Differentiate between a surge diverter and a surge absorber with sketch.

b) What is standard impulse test wave? [6+4]

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