

Code No: 117HX

**R13****JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B. Tech IV Year I Semester Examinations, March - 2017****SWITCH GEAR AND PROTECTION****(Electrical and Electronics Engineering)****Time: 3 Hours****Max. Marks: 75****Note:** This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

**Part- A (25 Marks)**

- 1.a) Explain the term Active recovery voltage with respect to circuit breaker. [2]
- b) Explain the specifications considered for a circuit breaker. [3]
- c) What is meant by relay setting? [2]
- d) Distinguish between induction cup relays and induction disc relays. [3]
- e) What are incipient faults? [2]
- f) List the different type of faults that are encountered in transformers. [3]
- g) What is unit type protection? [2]
- h) How the system is graded with respect to the time of operation of relays? [3]
- i) What is meant by insulation coordination? [2]
- j) How do you classify the voltage surges in high voltage installations and explain them? [3]

**Part-B (50 Marks)**

- 2.a) Explain the properties of SF<sub>6</sub> gas and why it is used in circuit breakers?
- b) A circuit breaker interrupts the magnetizing current of a 90 MVA transformer at 220kV. The magnetizing current of the transformer is 8% 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 60% of its peak value. The stray capacitance is 3250  $\mu$ F. The inductance is 40 H. [5+5]

**OR**

- 3.a) Explain the terms recovery voltage, restriking voltage and RRRV. Derive an expression for restriking voltage in terms of system capacitance and inductance
- b) Explain about the working of vacuum circuit breakers and give its advantages. [5+5]

- 4.a) Explain the operation of a directional over current relay with a neat circuit diagram.
- b) Explain in detail about the IDMT relays characteristics. [6+4]

**OR**

- 5.a) Explain the Operation principle and characteristics of MHO and off set MHO relay
- b) Compare Static relays with Electromagnetic Relays. [6+4]
- 6.a) Explain the importance of harmonic restraint relay along with its application.
- b) A 3 – phase, 2 pole, 33 KV, 8300 KVA alternator has neutral earthed through a resistance of 3.66 ohms. The machine has current balance protection which operates up on out of balance current exceed 20 % of full load. Determine % of winding protected against earth fault. [5+5]

**OR**

7. Explain with a neat schematic diagram the working of protection against magnetic inrush current in transformer. [10]
- 8.a) Explain with a neat block diagram the operation of the phase comparison scheme for protecting a feeder  
b) Explain the effects of ungrounded neutral on system performance. [5+5]
- OR**
- 9.a) Explain the operation of a carrier current protection of transmission line with a neat schematic diagram  
b) Explain the principle of operation of a Translay Relay protection for feeders. [5+5]
- 10.a) Discuss the phenomena of a lightning stroke.  
b) Explain the working of valve type lightning arrester. [5+5]
- OR**
11. Write short notes on the following:  
a) Causes of over voltages in power systems.  
b) Basic Impulse level and its significance. [6+4]

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