QPC: RJ18001161 AR - 18 Reg. No. | | | | | | | | | | |

GIET MAIN CAMPUS AUTONOMOUS GUNUPUR – 765022

B. Tech Degree Examinations, June – 2021

(Sixth Semester)

**BELPC6040 / BEEPC6040 – SWITCH GEAR & PROTECTION**

(Common to EE and EEE)

Time: 2 hrs Maximum: 50 Marks

**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions)** **(1 x 10 = 10 Marks)**

| Q.1. Answer ***ALL*** questions | [CO#] | [PO#] |
|---|---|---|
| a. On which of the following routine tests are conducted? | [CO 1] | [PO 1] |
| (i) Oil circuit breakers (ii) Air blast circuit breakers (iii) Minimum oil circuit breakers (iv) All of the above | | |
| b. Arc in a circuit behaves as? | [CO 1] | [PO 1] |
| (i) a capacitive reactance (ii) an inductive reactance (iii) a resistance increasing with voltage rise across the arc (iv) a resistance decreasing with voltage rise across the arc | | |
| c. Circuit breakers usually operate under | [CO 1] | [PO 1] |
| (i) transient state of short-circuit current (ii) sub-transient state of short-circuit current (iii) steady state of short-circuit current (iv) after D.C. component has ceased | | |
| d. ____ relays are used for phase faults on long line | [CO 2] | [PO 1] |
| (i) Impedance (ii) Reactance (iii) Either of the above (iv) None of the above | | |
| e. The pilot relay is provided to obtain | [CO 2] | [PO 1] |
| (i) high speed tripping (ii) delayed tripping (iii) preset tripping (iv) none of the above | | |
| f. Induction cup relay is operated due to changes in | [CO 2] | [PO 1] |
| (i) Current (ii) Voltage (iii) Impedance (iv) All of the above | | |
| g. Large internal faults are protected by | [CO 3] | [PO 1] |
| (i) Merz price percentage differential protection (ii) mho and ohm relays (iii) horn gaps and temperature relays (iv) earth fault and positive sequence relays | | |
| h. Buchholz relay cannot be used on | [CO 3] | [PO 1] |
| (i) three phase transformers (ii) air cooled transformers (iii) 500 kV transformers (iv) 1000 kV transformers | | |
| i. Ungrounded neutral transmission system is not recommended because of | [CO 4] | [PO 1] |
| (i) Insulation being overstressed due to over voltages (ii) Insulation overstress may lead to failure and subsequent phase to phase faults (iii) Being inadequately protected against ground fault (iv) All of the above | | |
| j. Basically a lightning arrester is a | [CO 4] | [PO 1] |

(i) surge diverter (ii) surge alternator
(iii)surge reflector (iv)surge absorber

**PART – B: (Short Answer Questions)** **(2 x 5 = 10 Marks)**

| Q.2. Answer ***ALL*** questions | [CO#] | [PO#] |
|---|---|---|
| a. What is resistance switching? | [CO 1] | [PO 1] |
| b. What is the phenomenon of arc formation in a circuit breaker? | [CO 1] | [PO 1] |
| c. What is the need of static relays protection? | [CO 2] | [PO 1] |
| d. Enumerate the various types of protections used in an alternator | [CO 3] | [PO 1] |
| e. What is system grounding? | [CO 4] | [PO 1] |

**PART – C: (Long Answer Questions)** **(6 x 5 = 30 Marks)**

| Answer ***ANY FIVE*** questions | Marks | [CO#] | [PO#] |
|---|---|---|---|
| 3. A 50 cycles, 3 phase alternator with grounded neutral has inductance of 1.6 mH per phase and is connected to a bus bar through a circuit breaker. The capacitance to earth between the alternator and circuit breaker is 0.003 μF per phase. The circuit breaker opens when RMS value of current 7500A. Determine the following:<br>i. Maximum rate of rise of restriking voltage<br>ii. Time for maximum rate of rise of restriking voltage<br>iii. Frequency of oscillations<br>Neglect first pole to clear factor. | **(6)** | [CO 1] | [PO 2] |
| 4. Explain the working of vacuum circuit breaker and mention its applications. | **(6)** | [CO 1] | [PO 1] |
| 5. Draw a neat sketch of an induction type over current relay (non-directional) and discuss its operating principle. | **(6)** | [CO 2] | [PO 1] |
| 6. Explain the working of differential relays. | **(6)** | [CO 2] | [PO 1] |
| 7. List the various faults that occur in the rotor of an alternator and how the rotor is to be protected from these faults? | **(6)** | [CO 3] | [PO 1] |
| 8. A star-connected, 3-phase, 10 MVA, 6·6 kV alternator is protected by circulating current protection, the star point being earthed via a resistance r. Estimate the value of earthing resistor if 85% of the stator winding is protected against earth faults. Assume an earth fault setting of 20%. Neglect the impedance of the alternator winding. | **(6)** | [CO 3] | [PO 2] |
| 9. Discuss the internal and external causes of over voltages in a power system. | **(6)** | [CO 4] | [PO 1] |
| 10. Describe the construction, principle of operation and advantages of expulsion type lightning arrester? | **(6)** | [CO 4] | [PO 1] |

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