R-15

Code: 5G264

III B.Tech. II Semester Regular & Supplementary Examinations May 2019
Switch Gear and Protection
(Electrical and Electronics Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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UNIT–I

1. a) Explain the following terms

    (i) Restriking voltage (ii) RRRV (iii) Recovery voltage (iv) Fuse   8M

    b) In a 132kV system, the reactance and capacitance up to the location of circuit breaker is 5Ω and 0.003µF respectively. Calculate value of critical resistance for suppressing transient oscillations.   6M

OR

2. a) Explain the principle, operation, advantages and disadvantage of oil circuit breaker?   8M

    b) In a short circuit test on a 220 kV. 3-phase CB with earthed neutral the following results were obtained. Fault p.f. is 0.4, recovery voltage is a 0.9 time of full line value, the breaking current is symmetrical and the restriking transient had a natural frequency of 10kHz. Determine RRRV, assuming that short circuit is an earthed fault.   6M

UNIT–II

3. a) Explain in detail the different comparators.   7M

    b) An IDMT type over-current relay is used to protect a feeder through 500/1 A CT. The relay has a Plug setting of 125% and TMS is 0.3. Find the time of operation of the Said relay if a fault current of 5000A flows through the feeder. Make use of the Following characteristics

PSM	2	3	5	8	10	15
Time for unity TMS(100% current)	10	6	4.5	3.2	3	2.5

7M

OR

4. a) Discuss the different types of distance relays? Compare their merits and demerits.   7M

    b) Discuss the principle of operation and construction of attracted armature relay with relevant diagram   7M

UNIT–III

5. a) Discuss the generators protection schemes against

     (i) stator faults   (ii) rotor faults   8M

    b) An 11KV, 120MVA, star connected alternator has reactance of 1.5 per unit per phase and a negligible resistance. If is protected by a merz-price balance current system which operates when out of balance current exceeds 10% of the full load current. If the neutral point is earthed through a resistance of 4Ω, find the proportion of windings is protected against earth fault.   6M

OR

6. a) Explain the percentage differential relay protection for star/delta transformer with relevant diagram showing all essential details.   8M

    b) A 3-Ø transformer rated for 33/11KV is connected star/ delta and the corresponding CT on the LV side has a ratio of 300/5. Determine the ratio of transformer on the HV side.   6M

UNIT–IV

7. a) Explain the translay protection scheme for feeders.   7M

    b) Discuss the over-current protection scheme for ring mains.   7M

OR

8. a) With neat sketch ,discuss the differential scheme for bus-bar protection   7M

    b) Explain 3-zone protection using distance relays for transmission lines.   7M

UNIT–V

9. a) What are the characteristics of lightning arresters?   5M

    b) Explain the different methods of neutral grounding.   9M

OR

10   Write short notes on the following :

    a) Resistance grounding   4M

    b) Perterson coil grounding   5M

    c) Zinc-oxide lightning arrester   5M

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IV B.Tech. I Semester Supplementary Examinations May 2018
Switch Gear and Protection
(Electrical and Electronics Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
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UNIT–I

1. a) Describe the construction and operation of a minimum oil circuit breaker?   7M

   b) Discuss the Principle of arc interruption in air blast-circuit breaker   7M

OR

2. a) A 11 kV, 50Hz alternator is connected to a system which has inductance and capacitance per phase of 10mH and 0.01 µF respectively. Determine i) the maximum voltage across the breaker contacts ii) Frequency of transient oscillation   iii) The average RRRV   iv) The maximum RRRV   8M

   b) Explain the process of current chopping in SF_6 breakers?   6M

UNIT–II

3. a) Explain what is meant by primary protection and backup protection?   6M

   b) Define the terms (i) Pick up value   (ii) Reset value (iii) Operating time and (iv) Reset time?   8M

OR

4. a) Classify the various types of over current relays and give their applications along with approximate characteristics?   6M

   b) A 3-phase 66/11 kV star-delta connected transformer is protected by Merz-price protection system. The CTs on the LT side have a ratio of 420/5 amp. Show that the CTs on the HT side will have a ratio of $70 : 5/\sqrt{3}$ 8M

UNIT–III

5. a) A 11kV, 100MVA alternator is provided with differential protection. The percentage of winding to be protected against phase to ground fault is 85%. The relay is set to operate when there is 20% out of balance current. Determine the value of resistance in the neutral to ground connection?   7M

   b) Discuss suitable protection schemes which are used for (i) rotor earth fault (ii) rotor open circuit of a synchronous generator?   7M

OR

6. a) A 40 MVA, 3-phase 220/132 kV transformer is star/delta connected. Find the CT rations on the two sides of the transformer for differential protection of the transformer. Draw the diagram for the same. Assume fault is more than 115% of full –load current and relay setting current is 5A.   7M

   b) What is the principle of harmonic restraint relay? Explain its application?   7M

UNIT–IV

7. a) Draw the schematic diagram of the carrier current protection scheme of lines. Also explain its working Principle? 7M

   b) Describe the protection of ring mains feeder with an example? 7M

OR

8. a) Describe the trip circuit diagram of 3-zone distance relay is used for the protection of a transmission line, why 3-zones are necessary? 7M

   b) What is the draw back of differential overcurrent protection for bus-bars and how it is overcome? 7M

UNIT–V

9. a) Describe the construction, Principle of operation of valve type lightning arresters? 9M

   b) A 132 kV, 3-phase, 50 Hz transmission line 192km long consists of three conductors of effective diameter 20mm arranged in a vertical plane with 4m spacing and regularly transposed. Find the inductance and KVA rating of the arc suppression coil? 5M

OR

10. a) What is the purpose of earthing? Distinguish between system earthing and equipment earthing. 7M

    b) Why is insulation coordination required in a large power system? What is meant by BIL of an equipment? 7M

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IV B.Tech. I Semester Supplementary Examinations November 2018
Switch Gear and Protection
(Electrical and Electronics Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
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UNIT–I

1. a) Derive the expression for restriking voltage and RRRV.

   b) For a 132 KV system the reactance and capacitance up to the location of the circuit breaker is 3 ohms and 0.015 micro farads respectively. Calculate the following
      i. the frequency of transient oscillations
      ii. The maximum value of restriking voltage across the contacts of the circuit breaker.
      iii. The maximum value of RRRV

OR

2. a) Describe the construction and operation of air blast circuit breaker

   b) Enumerate the properties of SF6 which render its use in high voltage circuit breakers

UNIT–II

3. a) Explain what is meant by primary protection and backup protection?

   b) Define the terms (i) Pick up value   (ii) Reset value (iii) Operating time and
      (iv) Reset time?

OR

4 a) Classify the various types of over current relays and give their applications along with approximate characteristics?

   b) A 3-phase 66/11 kV star-delta connected transformer is protected by Merz-price protection system. The CTs on the LT side have a ratio of 420/5 amp. Show that the CTs on the HT side will have a ratio of $70 : 5/\sqrt{3}$

UNIT–III

5. a) Explain how to protect generators against stator and rotor faults

   b) Discuss inter-turns fault protection in generators

OR

6. a) Explain percentage differential protection in transformers

   b) Describe the working of Buchholtz relay with near diagram

UNIT–IV

7. a) Explain protection of radial and ring main feeders.

   b) Discuss the three zone protection in transmission lines

OR

8. Discuss the protection of transmission lines using carrier current protection

UNIT–V

9. a) Explain the protective characteristics of a lightning arrester against the with- stand characteristic of equipment on a voltage – time curve?

   b) Calculate the reactance of a coil suitable for a 33kV, 3-phase transmission system of which the capacitance to earth of each conductor is 4.5 μF?

OR

10. a) Explain different types of earthing the neutral point of a power system.

    b) What is horn-gap arrester? Explain how it works?

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Code: 4G272

R-14

IV B.Tech. I Semester Regular Examinations Nov/Dec 2017
Switch Gear and Protection
(Electrical and Electronics Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)
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UNIT–I

1. a) Describe the construction, principle of operation and applications of SF_6 breaker?   7M

   b) A circuit breaker is rated as 2500A, 1500 MVA, 33 kV, 3-sec, 3-phase oil CB. Determine the rated symmetrical breaking current, rated making current, short time rating and rated service voltage?   7M

OR

2. a) What are the requirements of the contact material for a vacuum circuit breaker? Why is current chopping not a serious problem with such circuit breakers?   7M

   b) Explain the terms (i) restriking voltage   (ii) recovery voltage and (iii) RRRV   7M

UNIT–II

3. a) Determine the time of operation of an IDMT relay of rating 5A and having setting of 125% and TMS = 0.5. The relay is connected through a CT of 400/5A. The fault current is 4000 A. The operating time for PSM of 8 is 3.2 Sec.   7M

   b) Describe with block diagram the construction and Principle of operation of a Microprocessor based percentage differential relay scheme for the protection of power transformer?   7M

OR

4 a) With the help of neat diagram explain the principle of static differential relay?   6M

   b) What is universal torque equation? Using this equation derive the following characteristics (i) Reactance Relay   (ii) Mho Relay.   8M

UNIT–III

5. a) A 3-phase transformer having a line voltage ratio of 400/33,000 V is star –delta connected. The CTs on the 400 V side have a ratio of 800/5A. What must be the ratio of CTs on 33,000 V side?   7M

   b) Describe the construction, Principle of operation and applications of Buchholz Relay?   7M

OR

6. a) A 11 kV, 100 MVA alternator is grounded through a resistance of 5 Ohms. The CTs have a ratio of 1000/5. The relay is set to operate when there is an out-of balance current of 1 A. What percentage of the generator winding will be protected by the percentage differential scheme of protection?   7M

   b) What are the abnormal conditions in a large alternator against which protection is necessary? Discuss a protection scheme for an alternator against inter-turn faults?   7M

UNIT–IV

7. a) Explain the zonal protection scheme for feeder. Describe the reactance relay characteristic for 3-zone protection.   7M

    b) Discuss and compare briefly various bus-bar arrangements in a power system?   7M

OR

8. a) Describe the pilot wire protection its merits and demerits in detail?   7M

    b) Explain the time graded and current graded systems in over current protection?

                                                                                        7M

UNIT–V

9. a) Explain the protective characteristics of a lightning arrester against the with-stand characteristic of equipment on a voltage – time curve?   9M

    b) Calculate the reactance of a coil suitable for a 33kV, 3-phase transmission system of which the capacitance to earth of each conductor is 4.5 µF?   5M

OR

10. a) Explain different types of earthing the neutral point of a power system.   7M

    b) What is horn-gap arrester? Explain how it works?   7M

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