

IV B. Tech I Semester Regular Examinations, November – 2022**SWITCHGEAR & PROTECTION****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75**

*Answer any FIVE Questions
ONE Question from Each unit
All Questions Carry Equal Marks*

UNIT-I

- 1 a) Explain the phenomenon of current chopping and its effect on circuit interruption. Why is it more common in an air blast circuit breaker than in oil circuit breaker? [7]
- b) What are the ratings and specifications of a circuit breaker? [8]
- (OR)
- 2 a) Write the operation of an oil circuit breaker with neat diagram also Lists its advantages and disadvantages? [8]
- b) Classify circuit breakers. Explain the basic difference between oil circuit breaker and SF6 oil circuit breaker. [7]

UNIT-II

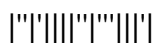
- 3 a) Derive operation characteristics of an impedance and reactance relay. Explain how you provide direction features to these relays? [8]
- b) With the help of a neat sketch the working of a balanced beam type relay? [7]
- (OR)
- 4 Compare the R-X characteristics of (i) impedance relay (ii) mho relay and (iii) reactance relay. Also give their applications? [15]

UNIT-III

- 5 Explain the protection of a generator against (i) loss of excitation (ii) stator inter turn fault and (iii) over speeding. [15]
- (OR)
- 6 a) Explain with a neat circuit diagram the differential protection scheme used to protect star-delta transformers. [7]
- b) A three phase transformer of 220/11000 line volts is connected in star/delta. The protective transformers on 220V side have a current ratio of 600/5. What should be ratio of current transformers on 11000V side? Draw the circuit also? [8]

UNIT-IV

- 7 a) Explain the three zone distance relay using impedance relays. [7]
- b) Describe the Translay protection scheme for feeder with neat diagram. [8]



(OR)

- 8 a) What is the importance of bus-bar protection? What are the requirements of protection of lines? [7]
b) Draw and explain the differential protection of bus bars. [8]

UNIT-V

- 9 a) Explain the need of static relays protection? Mention its merits. [7]
b) Describe the realization of Static MHO relay and static reactance relays. [8]

(OR)

- 10 a) What are the different types of grounding? Explain the reactance grounding? [7]
b) Discuss the causes of over voltages in a power system. [8]

JNTU FAST UPDATES



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UNIT-I

- 1 a) Explain the features of an air-blast circuit breaker by means of simple sketches. [7]
b) Describe with a neat sketch the principle of operation of a oil circuit breaker. [8]
- (OR)
- 2 a) What is resistance switching and derive the expression for the value of resistance to be inserted to reduce RRRV. [7]
b) Explain the working of a SF6 circuit breaker. [8]

UNIT-II

- 3 a) What is an impedance relay? Discuss its principle of operation. Show its characteristics on R-X diagram. What are the merit of this relay? [8]
b) Derive the equation for the torque developed in an induction relay? [7]
- (OR)
- 4 a) What are the various types of over current relays? Discuss their area of applications. [7]
b) Discuss in detail about the fundamental requirements of a protective relay? [8]

UNIT-III

- 5 a) Explain with the help of line diagram the connections and functioning of differential relay for generator protection. [7]
b) Discuss with a neat diagram the application of Merz-Price circulating principle for the protection of alternator [8]
- (OR)
- 6 a) Explain the protective scheme for the transformer that takes care of magnetizing inrush current without affecting the sensitivity. [7]
b) A 3-phase transformer rated for 33/6.6 KV is star/delta connected and the protection current transformers on the low voltage side have a ratio of 400/5A. Determine the ratios of CT's on the HV side. [8]



UNIT-IV

7 Explain over-current protection of feeders. How is the protection system graded with respect to the time of operation of relays for a radial feeder? [15]

(OR)

8 a) Discuss the operation of differential protection of bus bars with diagram? [8]

b) Describe the carrier current protection scheme with neat diagram? [7]

UNIT-V

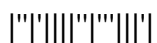
9 a) What are the advantages and disadvantages of microprocessor based digital relay with other relays. [7]

b) Explain directional over current static relays with neat block diagram. [8]

(OR)

10 a) Discuss the internal and external causes of over voltages in a power system. [7]

b) Describe the construction, principle of operation and application of valve type lightning arrester? [8]



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UNIT-I

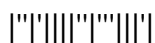
- 1 a) List the properties of SF₆ gas and explain how it is used in circuit breakers. [7]
b) Explain the reason for initiation of electric arc during contact separation. [8]
- (OR)
- 2 a) Explain in detail about Air blast circuit breaker with a neat circuit diagram. [7]
b) Discuss the rate of rise of restriking voltage and explain its importance in arc extinction. [8]

UNIT-II

- 3 a) Explain with a neat sketch the operation of an induction type over current relay. [7]
b) Derive the operating conditions of various types of distance relays. Discuss operating characteristics of these relays. [8]
- (OR)
- 4 a) What is mean by percentage bias? How is this achieved in a practice in a differential relay? Under what circumstances is a percentage differential relay preferred over the differential relay? [7]
b) Discuss in detail about the fundamental requirements of a protective relay? [8]

UNIT-III

- 5 a) With suitable diagram, describe the application of the Mertz-Price circulating current system to protect the alternator. What precautions must be taken in installing this system? [7]
b) Explain split-phase relaying protection of a 3- phase alternator with relevant diagrams? [8]
- (OR)
- 6 a) A 3- ϕ , star- delta 11/6.6 KV transformer is protected by means of differential protection system. The 6.6KV delta connected side has CT ratio 600/5. Calculate CT ratio on HT side. [7]
b) Explain in detail about Bucholtz relay with a neat sketch. [8]



UNIT-IV

- 7 a) Explain about the current graded system of protection and its disadvantages? [7]
b) Draw and explain the circuit for the protection of parallel feeders? [8]

(OR)

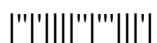
- 8 Describe the following system of bus bar protection: [15]
i) Differential protection Land ii) Faults bus protection.

UNIT-V

- 9 a) Write the advantages and disadvantages of static relays? [7]
b) Draw and explain the block diagram approach of numerical relays. [8]

(OR)

- 10 a) What are the various types of lightning arresters? Explain, with a neat sketch, the working of Zinc oxide lightning arrester. [8]
b) What are the methods of neutral grounding? Discuss the arcing grounding system with neat diagram? [7]



Code No: R1941021

R19

Set No. 4

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UNIT-I

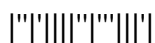
- 1 a) Describe with the aid of neat sketch the working of a air blast circuit breaker. [8]
b) What is meant by circuit breaker? Discuss the phenomenon of arc formation in a CB. [7]
- (OR)
- 2 a) Explain the construction and working of vacuum circuit breaker. [10]
b) Discuss the concept of auto reclosing. [5]

UNIT-II

- 3 a) What are the functions of current and time multiplier settings associated with induction type over current relay? [7]
b) With a neat diagram explain the working of induction type directional over current relay? [8]
- (OR)
- 4 a) Explain the distance relay protection scheme. [10]
b) Explain the expression the Universal torque equation. [5]

UNIT-III

- 5 a) What are various faults that occur in the rotor of an alternator and how the rotor is to be protected from these faults? [7]
b) Discuss suitable protection schemes which are used for [8]
i) rotor earth fault
ii) Rotor open-circuit of synchronous generator.
- (OR)
- 6 a) With aid of neat schematic diagram describe the percentage differential protection scheme of a transformer. [9]
b) What are the various types of transformer faults? List out the various protection schemes available for transformers. [6]



Code No: R1941021

R19

Set No. 4

UNIT-IV

- 7 a) Describe the three zone distance relay protection of the line using impedance relays. [8]
b) Draw and explain the time versus PSM curve with an example? [7]

(OR)

- 8 a) Draw and explain the differential protection of bus bars. [7]
b) Discuss in detail about the fault bus protection with using circuit diagram? [8]

UNIT-V

- 9 a) Discuss the operation of static instantaneous over current relay with circuit diagram? [7]
b) Describe the operation of static distance relay with neat diagram? [8]

(OR)

- 10 a) What is lightning? Describe the mechanism of lightning discharge by drawing suitable diagrams [7]
b) Explain the differences between equipment grounding and system grounding? [8]

