



7th Semester Examination –2021-22

Subject : Power System Protection
Course : B.Tech (EEE)
Full Marks : 70

Roll No :
Time : 3 Hours.

Instructions to the Candidates:

- Read the question paper very carefully.
- Candidates are required to give their answers in their own words as far as practicable.
- Question Paper is divided into Three Parts –A, B & C.
- Part-A is containing 12 multiple choice questions.
- Part- B containing SIX questions out of which FOUR questions are to be answered.
- Part C containing FOUR questions out of which TWO questions are to be answered.
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PART A

MULTIPLE CHOICE QUESTIONS

(12x1=12)

1. For safe operations, the transformer oil should have a minimum dielectric strength of:
a. 10 KV b. 20 kV c. 50V d. 100 KV
2. A transmission line is protected by
a. Time graded and current graded overcurrent protection
b. Distance Protection
c. Both 1 and 2
d. None of the above
3. A mho relay is used for protection of:
a. Protection of a transformer against external fault
b. Long Transmission Line
c. Protection of a transformer against all the internal faults and external fault
d. Medium Length lines
4. Plug setting multiplier is defined as the ratio of:
a. Fault current in relay coil x Pick up current
b. Fault current in relay coil / Pick up current
c. Fault current in relay coil x Transformer secondary turns
d. Fault current in relay coil / Transformer secondary turns
5. The rate of rise of restriking voltage is usually expressed in terms of:
a. kV / b. ms V / s c. kV / μ s d. MV/ns

6. The _____ the current, the _____ is the time required by fuse to blow up:
 a. Greater, smaller c. Greater, Greater
 b. Smaller, Smaller d. All of these are possible
7. The breaking capacity of the circuit breaker is in _____ and is measured in _____:
 a. R.M.S, kVA b. R.M.S, MVA c. Peak, kVA d. Peak, MVA
8. The major advantage associated with the fuse is:
 a. It is cheaper to use c. It requires no special maintenance
 b. Its time of operation is shorter than CB's d. All of these
9. Which is used for back up protection?
 a. Relay b. Circuit breaker c. Both A and B d. None of above
10. Which of these is not an essential quality of a protection system?
 a. Cheap in price b. Selectivity c. Reliability d. Speed of operation
11. Mathematically the making capacity is defined by the equation:
 a. $1.88 \times$ Symmetrical breaking capacity c. $2.55 \times$ Symmetrical breaking capacity
 b. $3.87 \times$ Symmetrical breaking capacity d. $4.99 \times$ Symmetrical breaking capacity
12. For the protection of transformers, harmonic restraint is used to guard against
 a. Magnetizing inrush current c. Unbalanced operation
 b. Lightning d. Switching over-voltage

PART B

ANSWER ANY FOUR OUT OF SIX

(4x7=28)

1. Explain the phenomenon of current chopping in a circuit breaker.
2. What are the types of fuse? Explain the points to be considered while selecting a fuse.
3. What is RRRV? Discuss symmetrical and asymmetrical breaking capacity, making capacity and short-time current rating.
4. What is power swing? What are the causes of over voltage on a power system?
5. What are the functions of protective relays? Describe static relay with merits and demerits.
6. Discuss Impedance relay construction and operation, Derive torque equation of impedance relay and explain Characteristics on R-X diagram.

PART C

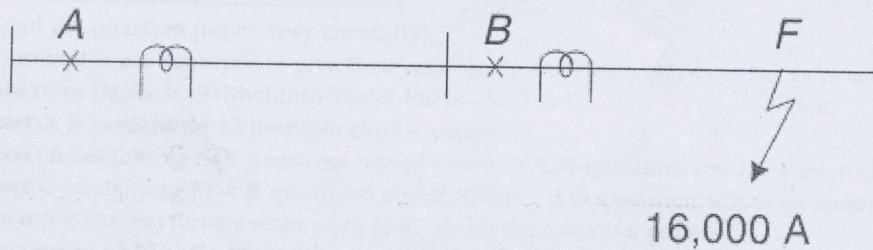
ANSWER ANY TWO OUT OF FOUR

(2x15=30)

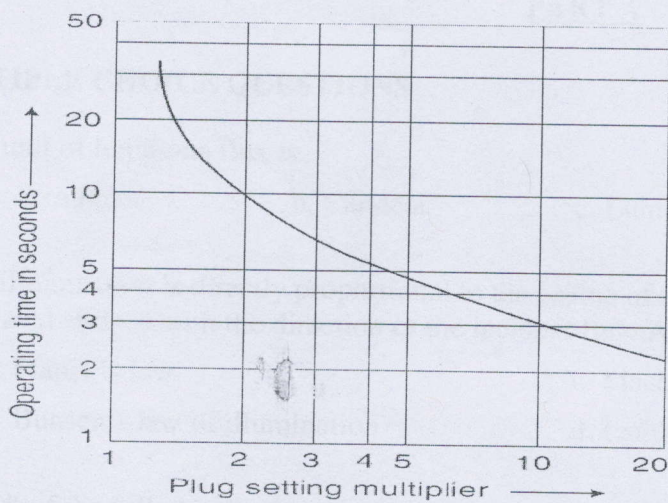
1. What are the various faults that would affect an alternator? In a 220 kV system, the reactance and capacitance up to the location of circuit breaker is 8 W and 0.025 mF, respectively. A resistance of 500 ohms is connected across the contacts of the circuit breaker. Determine the following:
 - a. Natural frequency of oscillation
 - b. Damped frequency of oscillation
 - c. Critical value of resistance which will give no transient oscillation
2. The value of resistance which will give damped frequency of oscillation, one-fourth of the natural frequency of oscillation.

Explain the following terms:

- i. Restriking voltage
 - ii. Recovery voltage
 - iii. RRRV
 - iv. Derive expressions for restriking voltage and RRRV.
 - v. What measures are taken to reduce them?
3. Enumerate various types of ratings of a circuit breaker. (a) Discuss symmetrical and asymmetrical breaking capacity (b) Making capacity (c) Short-time current capacity.
 4. An earth fault develops at point F on the feeder shown in the figure, and the fault current is 16000 A. The IDMT relays at points A and B are fed via 800/5 A CTs: The relay at B has a plug setting of 125% and time multiplier setting (TMS) of 0.2. The circuit breakers take 0.20 s to clear the fault, and the relay error in each case is 0.15 s.



For a plug setting of 200% on the relay A, determine the minimum TMS on that relay for it not to operate before the circuit breaker at B has cleared the fault. A relay operating time curve is same as shown in Figure below.





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PART A

MULTIPLE CHOICE QUESTIONS

(12x1=12)

1. The unit of luminous flux is
a. Steadman b. Candela c. Lumen d. Lux
2. The illumination is directly proportional to the cosine of the angle made by the normal to the illuminated surface with the direction of the incident flux. Above statement is associated with
a. Planck's law c. Macbeth's law of illumination
b. Bunsen's law of illumination d. Lambert's cosine law
3. Which of the following generators are used in arc welding
a. Shunt generators c. Series Generator
b. Cumulative compound generators d. Differential compound generators
4. Which of the following is not used to produce heat during welding?
a. Electric arc b. Chemical flame c. Electrical resistance d. Acetone flame
5. Long distance railways use which of the following?
a. 200 V D.C. c. 25 kV single phase A.C.
b. 25 kV two phase A.C. d. 25 kV three phase A.C.
6. The overall efficiency of steam locomotive is around
a. 5 to 10 percent b. 15 to 20 percent c. 25 to 35 percent d. 35 to 45 percent

7. In tramways which of the following motors is used?
- | | |
|---------------------------|---|
| a. D.C. shunt motor | c. D.C. series motor |
| b. A.C. three phase motor | d. AC. single phase capacitor start motor |
8. In a steam locomotive electric power is provided through
- | | |
|--------------------------|----------------------------|
| a. Overhead wire | c. Battery system |
| b. Small turbo-generator | d. Diesel engine generator |
9. The electric motor used for traction work should be mechanically
- | | |
|--|---|
| a. Small in overall dimensions | c. Light in weight and robust in construction |
| b. Capable to withstand continuous vibration | d. All of the above |
10. DC shunt motor are not suitable table for traction services because of their
- | | |
|---|------------------------|
| a. Hard characteristics | c. Large time constant |
| b. Power verifying directly with developed torque | d. All of the above |
11. What are the constituents in speed time curve of train?
- | | |
|-------------------|-------------------------|
| a. Coasting | c. Initial Acceleration |
| b. Constant Speed | d. All of These |
12. Which is used as electric drive in electric traction system
- | | |
|-------------------------|---------------------------------|
| a. Petrol-powered | c. From a diesel engine running |
| b. From battery running | d. All |

PART B

ANSWER ANY FOUR OUT OF SIX

(4x7=28)

1. Explain Traction Systems. Why a series motor is preferred for the electric traction.
2. Explain in detail Electric heating.
3. Define Drives. Write the Classification of drives.
4. What is plugging and Breaking. Name the different types of Breaking.
5. Define Electric Welding. Name the different types of Welding
6. Explain how rheostatic braking is done in D.C. shunt motors and series motor.

PART C

ANSWER ANY TWO OUT OF FOUR

(2x15=30)

1. Explain V-I Characteristics of Arc Welding DC Machines
2. Explain the different methods of Electric heating.
3. What are the advantages and disadvantages of Electrical Braking?
4. Explain the principle of Dielectric Heating in detail.



7th Semester Examination –2021-22

Subject : Fuzzy Logic Control
Course : B.TECH (EEE)
Full Marks : 70

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PART A

MULTIPLE CHOICE QUESTIONS

(12x1=12)

1. Which among the following gives the definition of fuzzy logic?
 - a) Fuzzy logic follows Boolean logic where zero stands for true and one stands for false
 - b) Fuzzy logic follows Boolean logic where zero stands for false and one stands for true
 - c) Fuzzy logic allows the assignment of any real number from zero to one to variables
 - d) Fuzzy logic allows the assignment of any whole number from zero to one to variables
2. Which among the following is the correct sequence of events that occur in application of fuzzy logic?
 - a) Fuzzily the input, execute the applicable rules, and de-fuzzily the output
 - b) Execute the applicable rules, fuzzily the input, and de-fuzzily the output
 - c) Fuzzily the input, de-fuzzily the output, and execute the applicable rules
 - d) Execute the applicable rules, fuzzily the input, and fuzzify the output
3. What is the term used to refer to variables that take non-numerical as input?
 - a) String variables
 - b) Character variables
 - c) Linguistic variables
 - d) Morphological variables
4. The truth values of traditional set theory is _____ and that of fuzzy set is _____.
 - a) Either 0 or 1, between 0 & 1
 - b) Between 0 & 1, either 0 or 1
 - c) Between 0 & 1, between 0 & 1
 - d) Either 0 or 1, either 0 or 1

5. Fuzzy Set theory defines fuzzy operators. Choose the fuzzy operators from the following.
a) AND b) OR c) NOT d) All of the mentioned
6. Which of the following is a type of Membership function?
a) Triangular b) Trapezoidal c) Sigma d) All of the mentioned
7. What is the form of Fuzzy logic?
a) Two-valued logic b) Crisp set logic c) Many-valued logic d) Binary set logic
8. Which of the following statements are true?
a. Both fuzzy logic and Probability theory operate in the range of [0, 1].
b. Fuzzy logic theory and operates on the degree of randomness while probability theory operates on the degree of belongingness.
a) I only c). II only
b) Both I and II d) Neither I nor II.
9. Which of the following represents the values of set membership?
a) Degree of truth b) Probabilities. c) Discrete set d) Both a) & b)
10. There are also other operators, more linguistic in nature, called _____ that can be applied to fuzzy set theory.
a) Hedges b) Lingual Variable c) Fuzz Variable d) None of the mentioned
11. Fuzzy logic is usually represented as _____
a) IF-THEN-ELSE rules b) IF-THEN rules
c) Both IF-THEN-ELSE rules & IF-THEN rules d) None of the mentioned
12. _____ are algorithms that learn from their more complex environments (hence eco) to generalize, approximate and simplify solution logic.
a) Fuzzy Relational DB b) Ecorithms
c) Fuzzy Set d) None of the mentioned

PART B

ANSWER ANY FOUR OUT OF SIX

(4x7=28)

1. What is predicate logic? Describe the properties of classical sets.
2. What is defuzzification? What are different methods of Defuzzification?
3. What are different types of decision making? Describe it briefly.
4. What are the different type probability and fuzzy logic?
5. Describe the operations on fuzzy sets. Describe the significance of fuzzy logic in control system.
6. What are the type's membership functions? Describe the features of membership function

PART C

ANSWER ANY TWO OUT OF FOUR

(2x15 =30)

1. What is fuzzification? Describe two important method of fuzzification.
2. What is adaptive fuzzy logic controller? Draw the block diagram. Describe basic steps for implementing adaptive algorithm.
3. Write the applications of fuzzy logic.
4. What are the advantages and disadvantages of fuzzy logic control?



7th Semester Examination –2021-22

Subject : Power System Analysis-II
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PART A

MULTIPLE CHOICE QUESTIONS

(12x1=12)

1. On slack bus _____ and _____ are specified:
a. Voltage Magnitude, Real power
b. Voltage Magnitude, Phase angle
c. Active, Reactive power
d. Active power, phase angle
2. At a load bus the quantities specified are:
a. P and Q
b. P and V
c. P and δ
d. V and δ
3. Which of the following is correct about Z bus matrix:
a. $Z_{bus}^{-1} = Y_{bus}$
b. $Z_{bus} = 2.Y_{bus}$
c. $Z_{bus} = Y_{bus}^{-1}$
d. $Z_{bus} = Y_{bus}^3$
4. Susceptance is _____ part of _____:
a. Real, Admittance
b. Imaginary, Admittance
c. Real, Conductance
d. Imaginary, Conductance
5. The dimension of bus incidence matrix is:
a. $n \times n$
b. $n \times (n-1)$
c. $n \times (n+1)$
d. $n \times (n+2)$
6. Which of the following matrix is used for load flow studies?
a. Y bus matrix
b. Z bus matrix
c. Unit matrix
d. Null matrix
7. The value of off diagonal elements is
a. which is connected between bus i and bus j with negative sign
b. which is connected between bus i and bus j with positive sign
c. sum of admittances connected at bus i
d. sum of admittances connected at bus j
8. In load flow studies PV bus is treated as PQ bus when

- a. Phase angle become high
 b. High Reactive power goes beyond limit
 c. Voltage at the bus become
 d. Any of the above
9. In power flow analysis for a voltage-controlled bus, which of the following is the unknown quantity?
 a. Real Power
 b. Reactive Power
 c. The absolute value of voltage
 d. None
10. The slack bus has to be a
 a. Generator bus
 b. Generator or Load bus
 c. Load bus
 d. Neither generator nor load bus
11. The bus admittance matrix of a power system is given by

$$\begin{bmatrix} -j50 & j10 & j5 \\ j10 & -j30 & j10 \\ j5 & j10 & -j25 \end{bmatrix}$$

The impedance line between bus 2 & 3 will be equal to

- a. $-j0.5$
 b. $j0.1$
 c. $j0.2$
 d. $-j0.2$
12. Compared to Gauss-Seidal Method, Newton-Raphson method takes
 a. Less number of iterations & more time per iteration
 b. Less number of iterations & less time per iteration
 c. More number of iterations & more time per iteration
 d. More number of iterations & less time per iteration

PART B

ANSWER ANY FOUR OUT OF SIX

(4x7=28)

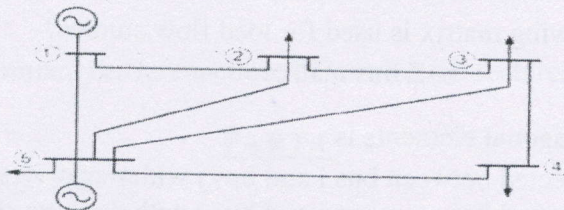
1. What is Load flow study? And what is its need?
2. What are the limitations of Gauss Seidal method? Write a comparison on Gauss Seidal method & Newton Raphson method.
3. Write short note on Bus admittance Matrix (Y-Bus matrix).
4. What are the different types of buses in power system? Explain each.
5. What are the various assumptions taken during transient stability studies?
6. Explain Voltage Stability in power system & its classifications.

PART C

ANSWER ANY TWO OUT OF FOUR

(15x2=30)

1. Explain & derive equation for Equal Area criterion?
2. What is transient stability? What are the factors which can improve transient stability?
3. Derive an expression for active & reactive power injected into bus.
4. Find the Y-bus (admittance bus) matrix.



Line (bus to bus)	Impedance
1-2	$0.02 - j 0.10$
1-5	$0.05 - j 0.25$
2-3	$0.04 - j 0.20$
2-5	$0.05 - j 0.25$
3-4	$0.05 - j 0.25$
3-5	$0.08 - j 0.40$
4-5	$0.10 - j 0.50$