

QUESTION 2019

Group - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following:
- i) The zero sequence current of a generator for L-G fault is 2.4 p.u. Then the current through the neutral during the fault is
 a) 2.4 p.u. b) 0.8 p.u. ✓c) 7.2 p.u. d) 0.24 p.u.
- ii) An equipment has per unit reactance of 0.9/m to a base of 20 MVA, 33 kV. The p.u. reactance to a base of 50 MVA and 11 kV, will be
 a) 4.5 b) 2 c) 0.9 ✓d) 20.25
- iii) The operator a rotates the vector through in the counter clockwise direction.
 ✓a) 90° b) 120° c) 180° d) 45°
- iv) A 3-phase breaker is rated at 2000 MVA, 33 kV; its making current will be
 a) 33 kA b) 49 kA c) 70 kA ✓d) 89 kA
- v) Zero sequence fault current is absent when the fault is
 a) single line to ground fault ✓b) line to line fault
 c) double line to ground fault d) none of these
- vi) An acceleration factor is used in Load Flow study by
 ✓a) Newton-Raphson method b) Gauss-Seidel method
 c) Decoupled method d) Fast Decoupled method
- vii) The unit of inertia constant H is
 a) MJS/MVA ✓b) MJ/MVA c) KV/KVA d) rad/MVA
- viii) A transformer rated for 500 kVA, 11kV/0.4kV has an impedance of 10% and is connected to an infinite bus. The fault level of the transformer is
 a) 500 kVA ✓b) 5000 kVA c) 500 MVA d) none of these
- ix) For a load-flow solution the quantities normally specified at a voltage controlled bus are
 ✓a) P and Q b) P and $|V|$ c) Q and $|V|$ d) P and δ
- x) Buchholz relay is used for
 a) motor protection b) generator protection
 c) feeder protection ✓d) transformer

xii) By burden of relay we generally mean

- a) volt ampere rating of relay
- c) voltage rating of relay

✓ b) current rating of relay
d) watt rating of relay

xiii) A 3-phase 4-wire system is commonly used for

- a) primary distribution
- b) secondary distribution
- c) primary transmission
- ✓ d) secondary transmission

xiv) In coal fired thermal power stations, what are the electrostatic precipitators used for?

- a) To remove dust particles settling on the bus bar conductors in the station switchyard
- b) To condense steam by electrostatic means
- c) To keep the air heaters clean
- ✓ d) To collect the dust particles from the flue gas

xv) For a fault at the terminals of synchronous generator, the fault current is maximum for a

- b) 3-phase to ground fault
- d) line to line fault
- ✓ c) line to ground fault

Group – B

(Short Answer Type Questions)

2. Explain the objectives of load flow analysis. Explain different buses in LFS.

See Topic: LOAD FLOW STUDIES, Short Answer Type Question No. 1.

3. Derive the equation for Gauss-Seidel method for load flow study. How is the convergence rate such a study improved?

See Topic: LOAD FLOW STUDIES, Long Answer Type Question No. 5(a).

4. Derive the swing equation for synchronous generator.

See Topic: POWER SYSTEM STABILITY, Long Answer Type Question No. 2.

5. What is doubling effect in 3-phase short circuit study? Explain.

See Topic: POWER SYSTEM STABILITY, Short Answer Type Question No. 5.

6. Explain the role of plug setting and time setting in over-current relay.

See Topic: PROTECTIVE RELAYS, Long Answer Type Question No. 6(c).

Group – C

(Long Answer Type Questions)

7. a) What do you mean by relay? What are the fundamental requirements of relay? Discuss MERZ-PRICE protection of transformer.

1st & 2nd Part: See Topic: PROTECTIVE RELAYS, Short Answer Type Question No. 2(1st & 2nd part).

3rd Part: See Topic: PROTECTIVE RELAYS, Long Answer Type Question No. 10(a).

- b) Determine the time of operation of relay of rating 5A and having a relay setting 5A and having a relay setting of 125%. TMS is 0.6. It is connected to a supply circuit through a CT of 400/5 A. The fault current is 4000 A.

PSM	2	4	5	8	10	20
Operating time	10	5	4	3	2.8	2.4

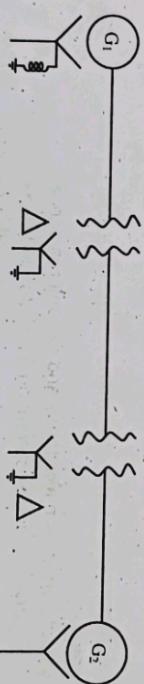
See Topic: PROTECTIVE RELAYS, Long Answer Type Question No. 8(b).

- 8 a) Define the terms 'steady state stability', 'Transient stability' and 'dynamic stability'.
See Topic: POWER SYSTEM STABILITY, Long Answer Type Question No. 3(a).

- b) A 50Hz 3-phase alternator is supplying 60% of P_{\max} to an infinite bus through a reactive network. A fault occurs which increases the reactance of the network between the generator internal voltage and the infinite bus by 400%. When the fault is cleared, the maximum power that can be delivered is 80% of the original maximum value. Determine the critical clearing angle for the condition described.

See Topic: POWER SYSTEM STABILITY, Long Answer Type Question No. 10.

- 9 a) Draw the positive, negative and zero sequence networks of the power system shown by one-line diagram.



- b) Determine the symmetrical components of the three voltages:

$$V_a = 220 \angle 0^\circ, V_b = 200 \angle 245^\circ, V_c = 200 \angle 105^\circ$$

See Topic: FAULTS IN ELECTRICAL SYSTEM, Long Answer Type Question No. 6(a) & (b).

10. a) Three generators, are rated as follows:

Generator 1: 100 MVA, 33 kV, reactance = 10%

Generator 2: 150 MVA, 32 kV, reactance = 8%

Generator 3: 110 MVA, 30 kV, reactance = 12%

Choosing 200 MVA and 35 kV as the base quantities, compute per unit reactance of the three generators referred to the base quantities. All the generators are connected to common bus bars.

See Topic: REPRESENTATION OF POWER SYSTEM COMPONENTS, Short Answer Type Question No. 3.

- b) Discuss the radial and ring main distribution network.

See Topic: DISTRIBUTION SUBSTATIONS, Long Answer Type Question No. 1(a).

- c) A 2-wire dc distributor cable AB is 2 km long and supplies loads of 100A, 150A, 200A and 50A situated at 500m, 1000m, 1600m and 2000m from the feeding point A. Each conductor has a

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resistance of 0.01Ω per 1000m. Calculate the voltage at each load maintained at point A.

See Topic: **DISTRIBUTION SUBSTATIONS**, Long Answer Type Question No. 1(a).

11. a) Why is one of the buses taken as slack bus in load flow studies?
- b) Write down the assumptions of Fast Decoupled load flow method.

c) The parameter of a 4-bus system are as under:

BUS CODE	LINE IMPEDANCE	CHARGING ADMITTANCE
1-2	$0.2 + j0.8$	$j0.02$
2-3	$0.3 + j0.9$	$j0.03$
2-4	$0.25 + j1.0$	$j0.04$
3-4	$0.2 + j0.8$	$j0.02$
1-3	$0.1 + j0.4$	$j0.01$

Draw the network and find bus admittance matrix.
See Topic: **DISTRIBUTION SUBSTATIONS**, Long Answer Type Question No. 1(a).

12. Write short notes on any three of the following:

- a) RRRV
 - b) Accelerator factor
 - c) Sparse matrix
 - d) Explanation of percentage reactance and per unit reactance
 - e) Effects of negative sequence current on alternator and transformers.
- a) See Topic: **CIRCUIT BREAKERS**, Long Answer Type Question No. 11(i).
- b) See Topic: **LOAD FLOW STUDIES**, Long Answer Type Question No. 12(b).
- c) See Topic: **LOAD FLOW STUDIES**, Long Answer Type Question No. 12(c).
- d) See Topic: **REPRESENTATION OF POWER SYSTEM COMPONENTS**, Long Answer Type Question No. 1.
- e) See Topic: **MISCELLANEOUS**, Long Answer Type Question No. 2(b).