

**CS/B.TECH/EE/EVEN/SEM-6/EE-602/2018-19**



**MAULANA ABUL KALAM AZAD UNIVERSITY OF  
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**Paper Code : EE-602  
POWER SYSTEM-II**

**Time Allotted : 3 Hours**

**Full Marks : 70**

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable.*

**GROUP - A**

**( Multiple Choice Type Questions )**

1. Choose the correct alternatives for any ten of the following :  $10 \times 1 = 10$
- 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.

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- ix) For a load-flow solution the quantities normally specified at a voltage controlled bus are
- $P$  and  $Q$
  - $P$  and  $|V|$
  - $Q$  and  $|V|$
  - $P$  and  $\delta$ .
- x) Buchholz relay is used for
- motor protection
  - generator protection
  - feeder protection
  - transformer.
- xi) By burden of relay we generally mean
- volt ampere rating of relay
  - current rating of relay
  - voltage rating of relay
  - watt rating of relay.
- xii) A 3-phase 4-wire system is commonly used for
- primary distribution
  - secondary distribution
  - primary transmission
  - secondary transmission.
- xiii) In coal fired thermal power stations, what are the electrostatic precipitators used for ?
- To remove dust particles settling on the bus bar conductors in the station switchyard
  - To condense steam by electrostatic means
  - To keep the air heaters clean
  - To collect the dust particles from the flue gas.
- xiv) For a fault at the terminals of synchronous generator, the fault current is maximum for a
- 3-phase fault
  - 3-phase to ground fault
  - line to ground fault
  - line to line fault.

**GROUP - B**

**( Short Answer Type Questions )**

Answer any *three* of the following.  $3 \times 5 = 15$

2. Explain the objectives of load flow analysis. Explain different buses in LFS.
3. Derive the equation for Gauss-Seidel method for load flow study. How is the convergence rate of such a study improved ?
4. Derive the swing equation for synchronous generator.
5. What is doubling effect in 3-phase short circuit study ? Explain.
6. Explain the role of plug setting and time setting in over-current relay.

**GROUP - C**

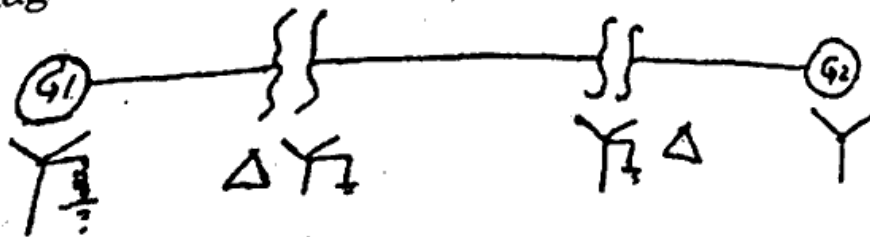
**( Long Answer Type Questions )**

Answer any *three* of the following.  $3 \times 15 = 45$

7. a) What do you mean by relay ? What are the fundamental requirements of relay ? Discuss MERZ-PRICE protection of transformer. 8
- (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. 7

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

8. a) Define the terms 'steady state stability', 'transient stability' and 'dynamic stability'. 7
- b) A 50 Hz 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. 8
9. a) Draw the positive, negative and zero sequence networks of the power system shown by one-line diagram. 6



- b) Determine the symmetrical components of the three voltages : 9
- $$V_a = 220 \angle 0^\circ, V_b = 200 \angle 245^\circ, V_c = 200 \angle 105^\circ$$
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. 5

[ Turn over

- b) Discuss the radial and ring main distribution network. 4
- c) A 2-wire dc distributor cable AB is 2 km long and supplies loads of 100A, 150A, 200A and 50 A situated at 500 m, 1000 m, 1600 m and 2000 m from the feeding point A. Each conductor has a resistance of  $0.01 \Omega$  per 1000 m. Calculate the voltage at each load point if a voltage of 300 V is maintained at point A. http://www.makaut.com 6
- d) Why is one of the buses taken as slack bus in load flow studies? 2
- e) Write down the assumptions of Fast Decoupled load flow method. 6
- f) 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.

7

12. Write short notes on any *three* of the following : 3 × 5

- 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.
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