Code No: R1632022 **R16** SET - 1

III B. Tech II Semester Supplementary Examinations, November – 2019

POWER SYSTEM ANALYSIS

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A (14 Marks)

1. a) Define the terms (i) sub graph (ii) oriented graph with example. [2M]
   b) Mention the types of buses we consider in power flow analysis. [2M]
   c) What are the advantages of using building algorithm method? [2M]
   d) What is the importance of short circuit currents in power system analysis? [2M]
   e) Define the terms negative sequence and zero sequence. [3M]
   f) How stability studies are classified? What are they? [3M]

PART –B (56Marks)

2. a) What is per unit system? Why it is required in power system calculations? [7M]
   b) Derive the expression of bus admittance matrix Y_{BUS} using singular transformation method. [7M]

3. a) With the help of a neat flow chart, explain the Newton - Raphson method of load flow solution when the system contains voltage controlled busses in addition to swing bus and load bus. [10M]
   b) Compare G-S method and N- R methods of load flow solutions. [4M]

4. Form Z_{BUS} through step-by-step method for the power system network, data given in table below: [14M]

Element	Bus Code	Self Impedance (p.u.)	Bus Code	Mutual Impedance (p.u.)
2	1-2	0.5		
3	2-3	0.2		
4	3-4	0.3		
5	3-1	0.4	2-3	0.1
1	4-1	0.3		

5. a) How the short circuit faults are classified? Explain them in detail. [4M]
   b) A transformer rated at 30 MVA having a short circuit reactance 0.05 p.u is connected to the bus bar of a generating station which is supplied through two 33 KV feeders each having an impedance of (1+2j) **Ω**. One of the feeders is connected to a generator using generator capacity of 60 MVA with a short circuit reactance of 0.1 p.u and other feeder to a generator with 80 MVA with reactance of 0.15 p.u. Calculate the MVA supplied to the fault in the event of a short circuit occurred on secondary terminals of the transformer. Also find fault current and short circuit current. [10M]
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6. a) Derive an expression for the fault current of the three different phases of an alternator, when a LLG fault occurs at the R-phase. Assume that the alternator neutral is isolated. [7M]

   b) A generator rated at 150 MVA, 22 kV has $X_1=X_2=15\%$ and $X_0=5\%$. Its neutral is grounded through a reactor of 0.35Ω. The generator is operating at rated voltage with load disconnected from the system. Find the sequential currents, sub transient current in the faulted phase and line to line voltages if a line to line fault occurred at the terminals of the alternator. [7M]

7. a) Derive the formula for calculating critical clearing angle. [7M]

   b) Draw a diagram to illustrate the application of equal area criterion to study Transient stability when there is a sudden increase in the input of generator. [7M]

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