Code No: RT32024 **R13** SET - 1

III B. Tech II Semester Supplementary Examinations, October/November - 2020

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. Answering the question in **Part-A** is compulsory
3. Answer any **THREE** Questions from **Part-B**

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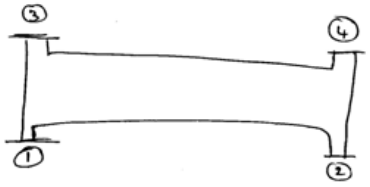
PART –A (22 Marks)

1. a) How can you select the base quantities? [3M]
   b) What is the need of slack bus? [4M]
   c) What are the four ways of adding impedance to an existing system so as to modify Z-bus matrix? [4M]
   d) How do you get the short circuit kVA from per unit impedance? [4M]
   e) What is the significance of symmetrical components? [3M]
   f) What are the methods considered for improving steady state stability? [4M]

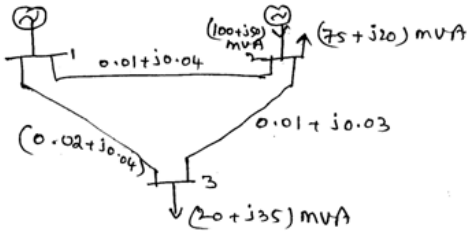
PART –B (48 Marks)

2. a) For the power system shown in below figure. Obtain the bus incidence matrix. Take ground as reference. Is this matrix is unique? Explain. [10M]



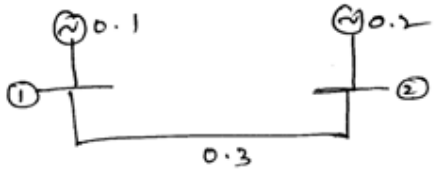
   b) Describe the step by step procedure for developing single line diagram of a given power system. [6M]

3. The power system network shown in below network, bus 1 is connected as a slack bus of voltage 1.4 $\angle 0^0$ p.u . The line impedances are indicated in the network on 100 MVA base and neglect the line shunt admittance [16M]



By using Fast Decoupled method at the end of first iteration, calculate the voltage magnitude and phase angle at buses 2 and 3.

4. a) Write an algorithm for the Modification of Z_{bus} Matrix for different cases. [8M]
   b) Determine the Z_{Bus} using building algorithm for the network shown in below figure. The values are in p.u reactance. [8M]



5. The plant capacity of a three phase generating station consists of two 8 MVA generators of reactance 14.5% each and one 4MVA generator of reactance 9.5%. These are connected to a common bus bar from which loads are taken through a number of transformers of 3MVA (step-up) each having 4% reactance. Determine the MVA rating of the circuit breakers on (i) L.V.side and (ii) H.V.side. Reactance's given are based on the MVA of each equipment. [16M]

6. a) What do you understand by sequence networks? What is their importance in unsymmetrical fault calculations? [8M]
   b) A 25 MVA, 13.2 kV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactance's are 0.35 and 0.1 p.u. respectively. A single line to ground fault occurs at the terminals of an unloaded alternator; determine the fault current and the line-to-line voltages. Neglect resistance. [8M]

7. a) Derive an expression for steady state stability limit of a short transmission line having send end and receiving end voltages V_s and V_r an impedance Z. [8M]
   b) A 4-pole, 50 Hz, 26 kV turbo alternator has a rating of 100 MVA, p.f 0.8 lag. The moment of inertia of rotor is 8000 kg-m^2. Determine M and H. [8M]

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