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Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **EE452 - Power System Operation & Control**

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Maximum Marks : **60**

Duration : **3 Hrs**

[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. All questions are compulsory.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Use of logarithmic table, drawing instruments and non programmable calculators is allowed.
5. Figures to the right indicate full marks.

1) Solve all sub-questions.

- a) State requirements of excitation system. [2]
- b) Draw block diagram of speed governing system [2]
- c) A passive load can be modeled as $Z=R+jX$. The power factor is 0.8. how would 1% drop in frequency affect real power? [2]

2) Solve any three sub-questions

- a) Explain equality and inequality generation constraints [5]
- b) Explain with the neat diagram construction and working of an electronic voltage regulator [5]
- c) Explain with neat diagram the static excitation system [5]
- d) Explain effects of real power on frequency and role of frequency in real power control system [5]

3) Solve any three sub-questions

- a) A 500 MW area A is interconnected with a 10000 MW area B. The parameters of each based on its own capacity base are $R=2\text{Hz/p.u. MW}$ & $D=0.01\text{p.u. MW/Hz}$. Area B experiences a load increase of 100 MW. Find the static frequency drop and change in tie line power. [5]
- b) Write a short note on tie line bias control [5]
- c) Describe the cross coupling between p-f and Q-V control channel [5]
- d) A 350 km long line has a total series impedance of $180\angle 75^\circ \Omega$ per phase and a total shunt admittance to neutral per phase of $1 \times 10^{-3} \angle 90^\circ$ Siemens. [5]
 - A) find ABCD parameters of the line without compensation.
 - B) find ABCD parameters if the line is provided with 60% series compensation

4) Solve any three sub-questions

- a) A 220 KV bus supplies a load of $0.8+j0.2$ pu through a short transmission line and a transformer. The pu reactance of the line and transformer are 0.2 and 0.05 pu respectively. If the voltage at load terminal is 1 pu, find voltage and power factor at 220 KV bus. Base MVA= 100, base KV=220KV. [8]

Also in above system if shunt capacitors are provided at the receiving end to supply reactive power requirement of 0.2pu, find the voltage and power factor at 220 KV bus
- b) Determine saving in Rs/Hr for economic distribution of load of 225 MW between two generators compared to equal load sharing where the incremental fuel cost characteristics are as follows: [8]

$$IC_1 = 0.075(P_1) + 15$$

$$IC_2 = 0.085(P_2) + 12$$

Compare with equal distribution of the same total load.
- c) A constant load of 400 mw is two 210 MW generators having fuel cost characteristics as shown below, [8]

$$C_1 = 0.05(P_1)^2 + 20(P_1) + 30$$

$$C_2 = 0.06(P_2)^2 + 15(P_2) + 40$$

Find the most economical load sharing between two units. Also find saving in Rs/day thereby obtained compared to equal load sharing between two generators
- d) Write a note on voltage stability and compare angle and voltage stability [8]

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