Code : 103601

B.Tech 6th Semester Exam., 2022

(New Course)

POWER SYSTEM—II

(Operation and Control)

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

*(ii) There are **NINE** questions in this paper.*

*(iii) Attempt **FIVE** questions in all.*

*(iv) Question No. **1** is compulsory.*

1. Choose the correct answer/Answer any *seven* of the following : 2×7=14

(a) The load carrying capability of a long a.c. transmission line is

(i) always limited by the conductor size

(ii) limited by stability considerations

(iii) reduced at low ambient temperatures

(iv) decreased by the use of bundled conductors

(b) Transient disturbances are caused by

(i) sudden load changes

(ii) switching operations

(iii) fault in power system

(iv) All of the above

(c) The stability of the power system is not affected by

(i) generator reactance

(ii) line reactance

(iii) line losses

(iv) excitation of generators

(d) Equal area criterion gives the information regarding

(i) stability region

(ii) absolute stability

(iii) relative stability

(iv) swing curves

(e) Load flow studies are carried out for

(i) load frequency control

(ii) planning of power system

(iii) fault calculation

(iv) study of stability

(f) If a voltage controlled bus is treated as a load bus, then which of the following limits would be violated?

(i) Voltage

(ii) Active power

(iii) Reactive power

(iv) Phase angle

(g) Compared to GS method, NR method takes

(i) less number of iterations and more time per iteration

(ii) less number of iterations and less time per iteration

(iii) more number of iterations and more time per iteration

(iv) more number of iterations and less time per iteration

(h) What is the function of phase shifters?

(i) What is the difference between SVC and STATCOM?

(j) What are the methods of neutral grounding?

2. (a) With neat flow chart, explain the load flow study using N-R power flow method. How does the method get modified when PV buses are also present? 7

(b) Derive the equations of various elements of Jacobian matrix in case of Newton-Raphson method. 7

3. (a) Derive the swing equation of a synchronous machine swinging against an infinite bus. Clearly state the assumptions made in deducing the swing equation. 7

(b) The steady-state limit of a power system is 150 MW. A generator with constant excitation is supplying 60 MW to the system. Estimate the maximum permissible sudden increase in generator output without causing instability. 7

4. *(a)* What are the different methods of voltage control in a power system? Explain the working of an on-load tap changing transformer. 7

(b) It is proposed to control the voltage of a 3-phase, 3·3 MVA feeder varying between 3 kV and 3·5 kV about 3·3 kV. Determine the minimum turn-ratio of the regulator. Find also its rating. 7

5. *(a)* What do you mean by power system security analysis? Explain using the power system state transition diagram. 7

(b) A 3-phase transmission line has a reactance of 15 ohm per phase. The voltage at each end is maintained at 66 kV (line-to-line). Determine the maximum steady-state power that can be transmitted by the line. Also determine the limits of angular oscillation for transient stability, when the above line develops a sudden jerk at 3/5th of the steady-state limit. 7

6. *(a)* Draw a general circuit, which can be used to determine the zero sequence network of a two-winding transformer. Draw the zero sequence network of *(i)* star-star transformer with star-point grounded and *(ii)* delta-delta transformer. 7

(b) A single-phase load of 100 kVA is connected across lines *bc* of a 3-phase supply of 3·3 kV. Determine symmetrical components of line current. 7

7. *(a)* Derive the necessary equation to determine the fault current for an *L-L-G* fault. Draw a diagram showing the interconnection of sequence networks. 7

(b) The per unit values of positive, negative and zero sequence reactances of a network at fault are 0·16, 0·14 and 0·2. Determine the fault current, if fault is double line to ground. 7

8. *(a)* Explain the function of a 3-phase static VAR compensator with necessary diagram. 7

(b) Explain the function of an automatic voltage regulator. What qualities should an AVR have? 7

9. Write short notes on the following : 14

(a) SCADA systems

(b) Equal area criterion

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