Seventh Semester B.Tech. Degree Examination, November 2015
(2008 Scheme)
08.702 : POWER SYSTEM ENGINEERING – III (E)

Time : 3 Hours
Max. Marks : 100

Instructions : Answer all questions from Part A and any one question from each Module of Part B.

PART – A

1. What are the different methods of solving SLFA? Explain the difference between Gauss and Gauss-Seidel method.

2. Distinguish between $Z_{BUS}$ and $Y_{BUS}$ in power system analysis.

3. What are the assumptions in FDLFA? What are the demerits of FDLFA?

4. Differentiate between Economic dispatch problems and unit commitment problem.

5. What are the needs for reactive power compensation in power system?

6. What are the benefits obtained from FACTS technology?

7. Derive the expression for swing equation. What is the use of swing equation?

8. Explain different terms associated with electric tractors.

9. What are the challenges and solutions associated with over voltages in power system?

10. What are forked lines? Obtain reflection and refraction coefficient of forked line from its equivalent circuit.

(10×4=40 Marks)
11. a) Single line diagram of a 3 bus system is shown in figure. All parameters are in p.u. Compute the voltage magnitude and angle at the end of first iteration using Gauss-Seidel Method with an acceleration factor $\alpha = 1.5$.

```
1.0560
1
-\jmath 3
2
-\jmath 4
-\jmath 5
3
PL_3 = 0.6
QL_3 = 0.3
P_{Q2} = 0.25
Q_{Q2} = 0.15
P_{L2} = 0.5
QL_2 = 0.25
```

b) Derive Jacobian elements in polar form.

OR

12. a) A 2 bus system consist of two power plants connected by a transmission line. The cost curve characteristics of the two plants are

\[ C_1 = 0.01 P_1^2 + 18 P_1 + 20 \text{ Rs./hr} \]
\[ C_2 = 0.03 P_2^2 + 33 P_2 + 40 \text{ Rs./hr} \]

When a power of 120 MW is transmitted from plant 1 to load (near to plant 2), a loss of 16.425 MW is occurred. Determine the optimal scheduling of plants and load demand if cost of received power is Rs. 26/MW/hr

b) Explain various constraints in unit commitment problem.

Module – II

13. a) What is meant by AGC ? What are the components in AGC ? Explain with the help of net sketch.

b) Explain how reactive power is controlled in power system using synchronous compensators, reactors and static VAR compensators.

OR
14. a) Explain the principle and operation of STATCOM with neat sketch.

b) A balanced 3Φ fault occurs at the middle of line 2 when the power transfer is 1.5 p.u. Here \( E = 1.2; V = 1; X_1 = X_2 = 0.4 \) p.u., \( X_G = 0.2 \)

i) Determine whether the system is stable for a sustained fault.

ii) The fault is cleared at \( \delta = 60^\circ \) is the system is stable? If so find maximum rotor slip.

Module – III

15. a) A train runs at an average speed of 50 Km/h between station situated at 2.5 Km apart. The train accelerates at 2 Km/hps and retards at 3 Km/hps. Find its maximum speed. Draw the speed time curve for the run and calculate the distance travelled by it before brakes are applied.

b) Explain different configurations of HVDC systems.

c) Write a short note on HVDC development in India.

OR

16. a) Derive the expression for reflection and refraction coefficients when travelling wave is subjected to line termination with a cable of impedance \( Z \) Ω.

b) A transmission line having surge impedance 400Ω is terminated by two cable having \( Z = 50 \) Ω each. When this line is subjected to lightning stroke of 100 KV, find reflected and refracted values of voltage and current.

c) Explain the operation of following surge arresters with the help of neat sketch.

i) Rod gap

ii) Non-linear surge arresters