C 62961 (Pages : 4) Name.....

Reg. No.....

SEVENTH SEMESTER B.TECH. (ENGINEERING) DEGREE [SUPPLEMENTARY] EXAMINATION, APRIL 2014

(2009 Scheme)

EE/PTEE 09 701—POWER SYSTEM ANALYSIS

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *the questions.*
Each question carries 2 *marks.*

1. What are the different buses in Load Flow studies ?
2. Give the objective function and the system constraints in Economic Load Dispatch.
3. What do you mean by short circuit capacity of a Bus and its importance ?
4. Explain Swing Equation.
5. Give the advantages and disadvantages of Fast de-coupled load flow method.

(5 × 2 = 10 marks)

Part B

Answer **four** *questions out of six.*

6. Compare Gauss —Seidal method and Newton-Raphson method used for load flow studies.
7. Explain with neat diagram how critical clearing angle is calculated during fault conditions ?
8. Explain the selection of circuit breakers based on the fault level and interruption time.
9. Explain hydrothermal coordination.
10. Explain per unit system. How impedance diagram can be drawn from single line diagram of power system.
11. Explain how generating units are committed on the basis of forecasted load and operating requirements and also state the difference between this method and economic load dispatch ?

(4 × 5 = 20 marks)

Part C

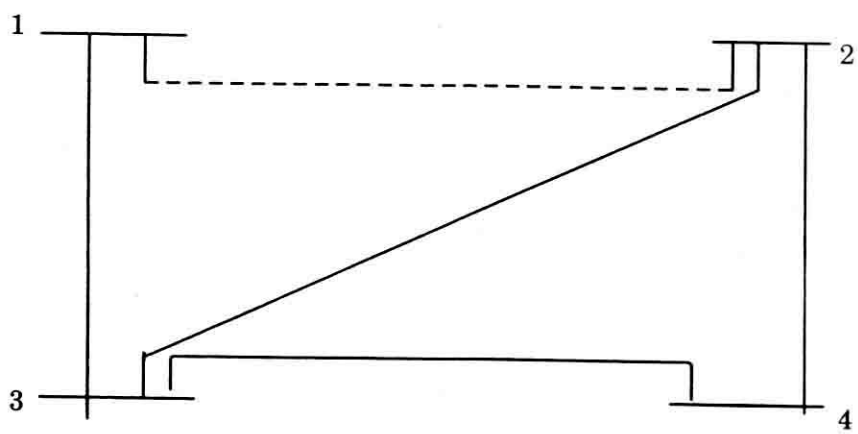
Answer any **one** *question from each module.*

12. (a) Explain Y bus formulation by singular transformation.

(b) The below figure shows the one line diagram of a simple four bus system. The table gives the line impedances identified by the buses on which they terminate. The shunt admittance at all the buses is assumed negligible.

(i) Find Y_{bus} assuming that the line shown dotted is not connected.

(ii) What modifications need to be carried out in Y_{bus} if the line shown dotted is connected



Line, Bus to Bus	R, *p.u.*	X, *p.u.*
1— 2	0.05	0.15
1—3	0.10	0.30
2—3	0.15	0.45
2—4	0.10	0.30
3—4	0.05	0.15

Or

13. (a) Explain the algorithm of Gauss-Seidel iterative method for the solution of load flow equations.

(b) The following is the system data for a load flow solution

The line admittances :

Bus code	*Admittance*
1—2	2—j 8.0
1—3	1—j 4.0
2—3	0.666—j 2.664
2—4	1—j 4.0
3—4	2—j 8.0

The schedule of active and reactive powers :

Bus code	P	Q	V	*Remarks*
1	-	-	1.06	Slack
2	0.50	0.20	1+j 0.0	PQ
3	0.40	0.30	1+j 0.0	PQ
4	0.30	0.10	1+j 0.0	PQ

Determine the voltages at the end of first iteration using Gauss-Seidel method. Take $\alpha = 1.6$

14. Give the detailed explanation of load frequency control of an isolated power system along with complete block diagram representation.

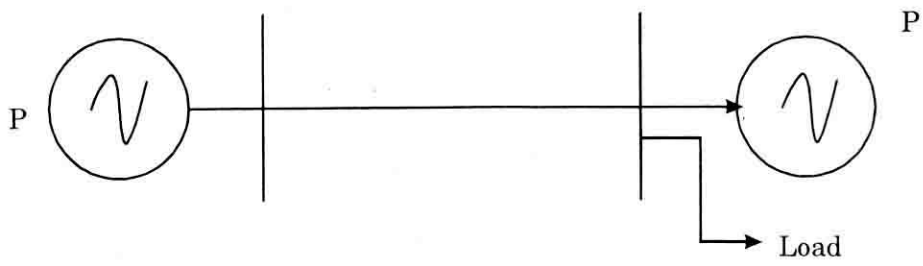
Or

15. (a) Formulate optimum load dispatch problem considering transmission losses.

(b) A two bus system is shown in figure. If the load of 125 MW is transmitted from plant 1 to the load, a loss of 15.625 MW is incurred. Determine the generation schedule and the load demand if the cost of received power is Rs. 24 / MWhr. Solve the problem using coordinating equations and penalty factor method approach. The incremental production costs of the plants are

$(dF_1 / dP_1) = 0.025\ P_1 + 15$

$(dF_2 / dP_2) = 0.05\ P_2 + 20$



16. A 25 MVA, 13.3 KV alternator with solidly grounded neutral has a subtransient reactance of 0.25 p.u. The negative and zero sequence reactances 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. Also determine the fault current and the line to line voltage at the fault occurs at the terminals of the alternator.

Or

17. Explain different types of shunt type faults with neat diagram. Also explain how the sequence networks are connected in all the above cases with the expression for fault current in each phase ?

18. A 60 Hz synchronous generator having inertia constant H = 5 MJ/MVA and direct axis transient reactance X_d'= 0.3 per unit is connected to an infinite bus through a purely reactive circuit as shown in figure. Reactances are marked on the diagram on a common system base. The generator is delivering real power P_e = 0.8 per unit and Q = 0.074 per unit to the infinite bus at a voltage of V = 1 per unit

    (a) A temporary three phase fault occurs at the sending end of the line at point F. When the fault is cleared both the line are intact. Determine the critical clearing angle and the critical fault clearing time.

    (b) A three phase fault occurs at the middle of one of the lines, the fault is cleared and the fault line is isolated. Determine the critical clearing angle.

Or

19. Explain with a neat diagram the role of Automatic Voltage Regulators (AVR) in improving stability.

[4 × 10 = 40 marks]