KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level : B. E.
Year : IV

Course : EPEG 413
Semester: I

Exam Roll No. :

Time: 30 mins.

F. M. : 10

FEB 18 2019

Registration No.:

Date :

SECTION "A"
[20 Q. × 0.5 =10 marks]

Choose and **encircle** the most appropriate answer.

1. To meet the reactive power requirements at load centers usually:
   a. shunt capacitors are used
   b. series capacitors are used
   c. tap changing transformers are used
   d. shunt reactors are used

2. The injection of VARs is required to:
   a. compensate for line losses
   b. get a good voltage profile
   c. increasing the voltage at the receiving end
   d. all of above

3. The incremental fuel costs for two generating units G_1 and G_2 are given by: $IC_1 = 25 + 0.2\ PG_1$ and $IC_2 = 32 + 0.2\ PG_2$, where PG_1 and PG_2 are real powers generated by the units. The economic allocation for a total load of 250 MW, neglecting transmission loss, is given by:
   a. 142.5 MW and 107.5 MW
   b. 109.75 MW and 140.25 MW
   c. 125 MW and 125 MW
   d. 100 MW and 150 MW

4. During load shedding:
   a. system voltage is reduced
   b. system frequency is reduced
   c. system loads are switched off
   d. system power factor is changed

5. When the power system is not in a position to meet the load it will restore to:
   a. power factor improvement at the generator
   b. load shedding
   c. efficient plant operation
   d. penalising high load consumers by increasing the charges

6. Advantages of the improved power factor are:
   a. increase in operating efficiency of the power system
   b. improvement in voltage regulation
   c. reduction in overall cost per unit
   d. better utilization of kW capacities of prime movers, transformers, switchgear and the lines

7. The surge impedance of a 400 kV, 100 km transmission line is 300 ohms. For a 200 km length the line surge impedance will be:
   a. 300Ω b.150 Ω c.600 Ω d.400 Ω

8. Series capacitors on transmission lines are of little use when:
   a. the load VAR requirement is small
   b. the load VAR requirement is large
   c. the load VAR requirement is fluctuating
   d. series capacitors are never used in transmission lines

9. The loads on 3-phase, 4-wire distributors are usually:
   a. balanced b. either of above c. unbalanced d. none

10. Which of the following results in symmetrical fault?
   a. single phase to earth b. phase to phase
   c. all the three phase to earth d. two phase to earth

11. Which portion of the transmission system is more prone to faults?
   a. Alternator b. Transformer c. Overhead lines d. Underground cable

12. For a fault at the terminals of synchronous generator, the fault current is maximum for a:
   a. 3-phase fault b. 3-phase to ground fault
   c. Line to line fault d. Line to ground fault

13. A transformer rated for 500 kVA, 11 kV/ 0.4 kV has an impedance of 10% and is connected to an infinite bus. The fault level of the transformer is:
   a. 500 kVA b. 5000 kVA
   c. 500 MVA d. 250 kVA

14. In a star-connected system without neutral grounding, zero sequence current are:
   a. zero
   b. phasor sum of phase current
   c. same as rms value of phase currents
   d. same as peak value of phase currents

15. A 500 MVA, 50 Hz, 3-phase turbo-generator produces power at 22 kV. Generator is Y-connected and its neutral is solidly grounded. Its sequence reactances are X1 = X2 = 0.15 and X0 = 0.05 pu. It is operating at rated voltage and disconnected from the rest of the system (no load). The magnitude of the sub-transient line current for single line to ground fault at the generator terminal in PU will be:
   a. 2.851 b. 3.333 c. 6.667 d. 8.553

16. Steady state stability of a power system is improved by:
    a. reducing fault clearing time
    b. using double circuit line instead of single circuit line
    c. single pole switching
    d. decreasing generator inertia

17. Equal area criterion gives the information regarding:
    a. stability region
    b. relative stability
    c. absolute stability
    d. swing curves

18. Load flow study is carried out for:
    a. load frequency control
    b. planning of power system
    c. fault calculation
    d. study of system stability

19. LFA involve solving simultaneous:
    a. linear algebraic equations
    b. non-linear algebraic equations
    c. linear differential equations
    d. non-differential equations

20. A voltage controlled bus is specified by:
    a. real power and reactive power
    b. reactive power and voltage
    c. voltage and phase angle
    d. real power and voltage

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Level : B. E.
Year : IV
Time : 2 hrs. 30 mins.

Course : EPEG 413
Semester: I
F. M. : 40

SECTION "B"
[5 Q. × 8 = 40 marks]

*Attempt **ANY FIVE** questions. Assume any suitable data if necessary.*

1.

a. What is economic load dispatch in power system? What is the objective of load dispatch in economic load scheduling? [2+2]

b. Write down about the direction of active power flow in brief. Bus A, the reference bus, has a voltage of 527 kV at an angle of -16 degrees. Bus B voltage is equal to 542 kV at an angle of -19 degrees. Load 1 has a power factor of 0.93, while load 2 has a power factor of 0.82. If the total impedance of the transmission path is 75 ohms, find (a) the real power flow, (b) the direction of real power flow, (c) the reactive power flow, and (d) the direction of reactive power flow? [1+3]

2.

a. What is the advantage of per unit method over percent method? A simple power system is shown in Figure 1. Redraw this system where the per-unit impedances are represented on a common 5,000 VA base and common system base voltage of 250 V. [1+4]

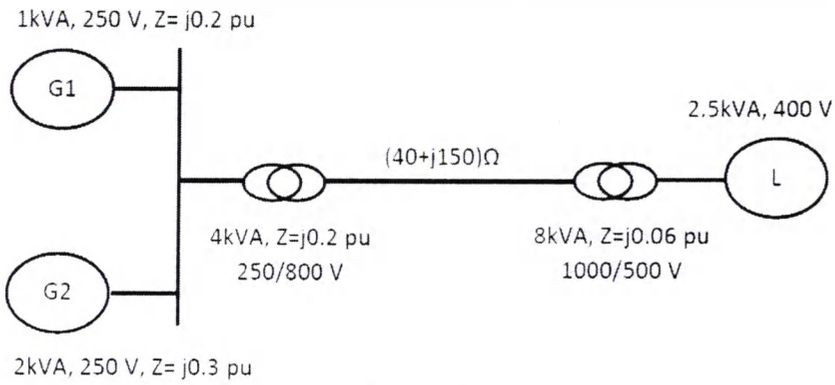

Figure 1

b. What is the need for system analysis in planning and operation of power system? Explain. [3]

3.

a. How financial aspect plays an important role in the design and construction of transmission and distribution line? [2]

b. The following is the system data for load flow solution:

Bus	P	Q	V	Remarks
1	-	-	1.06	Slack
2	0.5	0.2	1 + j 0.0	PQ
3	0.4	0.3	1 + j 0.0	PQ
4	0.3	0.1	1 + j 0.0	PQ

Bus	1-2	1-3	2-3	2-4	3-4
Admittances	2 – j 8.0	1 – j 4.0	0.666-j2.664	1 – j 4.0	2 – j 8.0

Determine the voltages at the end of first iteration using GS method. Take $\alpha = 1.6$. [6]

4.

a. Explain the important fault types occurred in power system with necessary circuit diagram and final mathematical expressions. [4]

b. In Figure 1, a 3-phase fault occurs at a point in between the second transformer and load, when the system is on no load but at rated voltage. Determine the actual fault MVA and fault current. [4]

5.

a. Explain the different methods to improve the steady state limit. Also explain, how the concept of equal area criterion describes the system stability. [2+2]

b. A synchronous motor is receiving 30% of the power that is capable of receiving from an infinite bus. If the load on the motor is increased by 1.75 times, determine the maximum value of load angle δ during the swinging of the motor around its new equilibrium position. [4]

6. Write short note on the topics. [2+2+2+2]

a. Per unit method

b. Complex power triangle

c. Optimal load flow solution

d. Power system stability