KATHMANDU UNIVERSITY
End semester Examination
August, 2018

Marks scored:

Level : B.E
Year : III

Course : EPEG 315
Semester: II

Exam Roll No.:

Time: 30 mins.

F.M. : 20

Registration No.:

Date AUG 15 2018

SECTION "A"
[20 Q.×1=20 marks]

1. By increasing the transmission voltage to double of its original value the power can be dispatched keeping the line loss
   a. equal to original value
   b. half the original value
   c. double the original value.
   d. one fourth of original value.

2. Sheaths are used in cables to
   a. provide proper insulation
   b. provide mechanical strength
   c. prevent ingress of moisture
   d. reduce corona loss

3. To reduce corona effect usually
   a. the distance between the conductors is reduced
   b. the conductor diameter is reduced
   c. bundled conductors are used
   d. stranded conductors are used

4. Bundled conductors are mainly used
   a. to increase the shunt capacitance
   b. to decrease the shunt capacitance
   c. to increase the series reactance
   d. to decrease the series reactance

5. For the short line if the receiving end voltage is equal to sending voltage under loaded conditions
   a. the sending power factor is unity
   b. the receiving end power factor is unity
   c. the sending end power factor is leading
   d. the receiving end power factor is leading

6. If the frequency of a transmission system is changed from 50 Hz to 100 Hz, the string efficiency
   a. will increase.
   b. remains unchanged
   c. will decrease
   d. may increase or decrease depending on the line parameters

7. High voltage long lines are transposed because
   a. Corona losses can be minimized
   b. Computation of inductance become easier
   c. Voltage drops in the lines can be minimized
   d. Phase voltage imbalances can be minimized

8. The inductance of a line is minimum when
   a. GMD is high
   b. GMR is high
   c. both GMD and GMR are high
   d. GMD is low but GMR is high

9. The regulation of a line at full load 0.8 pf lagging is 12%. The regulation at full load 0.8 pf leading can be
   a. 24% b. 18% c. 12% d. 4%

10. The rating of circuit breaker is in terms of
    a. volt – ampere b. current c. voltage d. VAR

11. Skin effect in a conductor becomes more pronounced
    a. at Higher frequency
    b. at lower frequency
    c. high resistance
    d. low resistance

12. The use of a guard ring
    a. equalizes the voltage division between insulator discs
    b. provided mechanical strength
    c. increase power transmission capability of the line
    d. reduce voltage drop

13. The inductance of a single phase two conductor power transmission line per km becomes double when the
    a. Radius of the conductor is doubled
    b. Distance between the conductors is doubled
    c. Distance between the conductors is increased four fold
    d. Distance between the conductors is increased as square of the original distance

14. Corona loss increases with
    a. Increase in supply frequency and conductor size
    b. Increase in supply frequency and reduction in conductor size
    c. Decrease in supply frequency and reduction in conductor size
    d. Decrease in supply frequency and increase in conductor size

15. ACSR conductor having 7 steels strands surrounded by 25 aluminum conductors will be specified as
    a. 7/25 b. 7/32 c. 5/7 d. 25/32

16. Whenever there is the dead –end or there is a change in the direction of transmission line, the insulators used are of the type
    a. Pin type
    b. Suspension type
    c. Strain type
    d. Shackle type

17. A three phase transmission line of negligible resistance and capacitance has an inductive reactance of 100 ohms per phase .When the sending end and receiving end voltages are maintained at 110 kV, the maximum power that can be transmitted will be
    a. 121 MW b. $121\sqrt{3}$ MW c. 363 MW d. 363 kW

18. The charging current in the transmission line increases due to corona effect because corona increases
a. Line current
b. Effective line voltage
c. Power loss in line
d. Effective conductor diameter

19. A single phase line has two parallel conductors 2 metre apart. The diameter of each conductor is 1.2 cm. What is the loop inductance per km of the line?
a. 2.423 mH b. 1.234 mH c. 3.267 mH d. 8.632 mH

20. A three phase transmission line has its conductors at the corners of an equilateral triangle with sides 3m. The diameter of each conductor is 1.63 cm. What is the inductance of the line per phase?
a. 1.232 mH b. 1.184 mH c. 2.236 mH d. 2.68 mH

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SECTION "B"
[5Q.×11=55 marks]

Attempt ***ANY FIVE*** questions. Assume necessary parameters if required.

1.i) Explain the issues that limit selection of high working voltage. What are the reasons for adopting high transmission voltage in electrical power transmission? [3+2]

ii) Explain with reasons: [3+3]

a) Bundled conductor lines have lower inductance than single conductor lines of the same area of cross section.

b) The geometric mean radius (GMR) of a stranded conductor is less than that of a solid conductor of the same overall diameter.

2.i) The six conductors of a double circuit three phase line are arranged as shown in figure-1. Deduce the formula for calculating capacitance per phase per km in terms of side D and conductor radius r. Also if D=3.5 m and r=1.09 cm find the capacitance per phase per km and capacitance per conductor per km. If the line voltage is 132 kV and line length 100 km, find the charging current and charging megavolt amperes. [6]

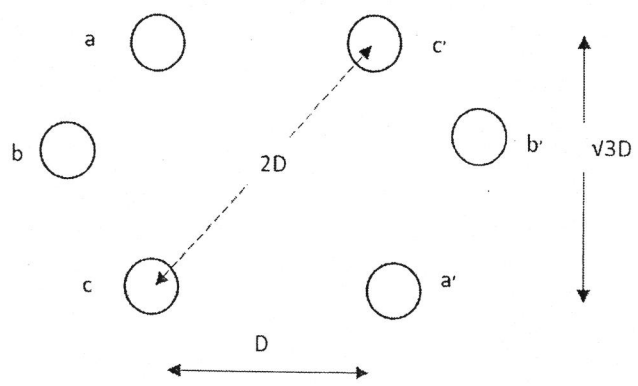

Figure-1

ii) Explain why the voltage across the insulators in a transmission lines are not equal and describe practical methods to improve this distribution. [5]

3.i) Develop the reactance diagram of the network in figure-2 and express all the parameters in pu values with base power=1000 kVA and base voltage=11kV at side of generator 1. Consider that the load draws a current of 1200 A. [5]

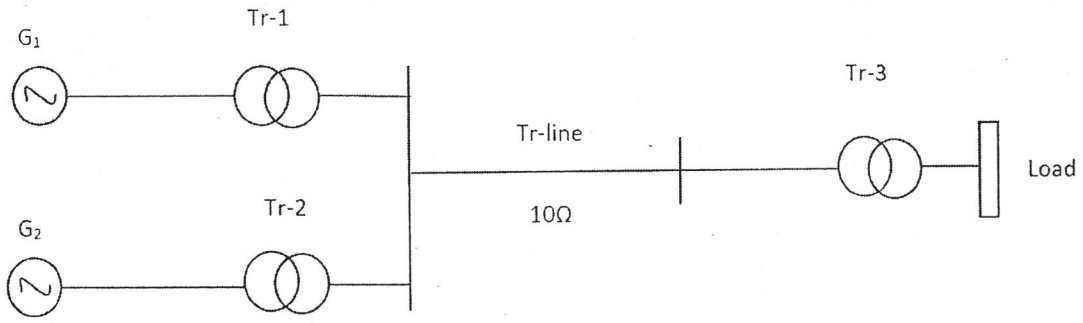

Figure-2

G_1=1000kVA, 11kV, X_{G1}=2.5%
G_2=500kVA, 11kV, X_{G2}=0.1pu
Tr-1=1000kVA, 11kV/66 kV, X_{tr-1}=2%
Tr-2=500kVA, 12.5kV/75 kV, X_{tr-2}=2%
Tr-3=1500kVA, 66kV/400 kV, X_{tr-3}=2%

ii) An overhead transmission line conductor having a parabolic configuration weighs 1.925 kg per meter of length. The area of X-section of the conductor is 2.2 cm^2 and ultimate strength is 8000kg/cm^2. The supports are 600 m apart having 15 m differences of levels. Calculate the sag from the taller of the two supports which must be allowed so that the factor of safety shall be 5. Assume that ice load is 1 kg per meter run and there is no wind pressure. What are the utilities of stringing chart? [4+2]

4.i) Deduce expressions for the sending end and receiving end power of a line in terms of voltages and ABCD constants. Show that the real power transferred is dependent on the power angle and the reactive power transferred is dependent on the voltage drop in the line. [6]

ii) Describe the phenomenon of corona. Discuss the factors which affect corona loss. Explain how the corona consideration affect the design of a line. [2+3]

5.i) The loading on a distributor is shown as in figure-3. The resistance and reactance of feeder per km length are 0.06Ω and 0.1Ω respectively. If the voltage at far end is to be maintained at 220 V. Calculate voltage at sending end and its phase angle. [4]

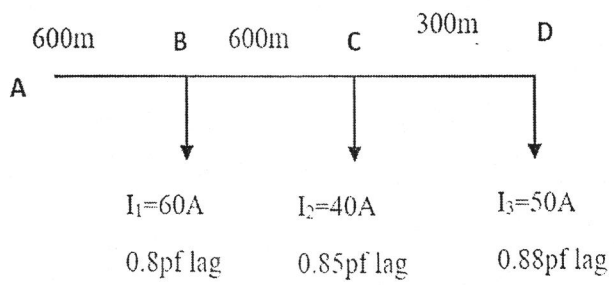

Figure-3

ii) Define capacitance grading. The inner conductor of a concentric cable has diameter of 3 cm with insulation of diameter 8.5 cm.The cable is insulated with two materials having relative permittivity's of 5 and 3 with corresponding safe working stresses of 38 kV/cm and 26 kV/cm.Calculate the radial thickness of insulating layers and the safe working voltage of the cable. [3+4]

6.i) Discuss the technical and economic advantages of dc systems over ac systems. [2]

ii) Explain basic principle of operation of circuit breaker. [2]

iii) Explain the various types of distribution system for three phase ac supply. [3]

iv) What is skin effect? How does it influence the resistance, inductance and capacitance of a conductor? [2+2]