


Kafrelsheikh University Faculty of Engineering Electrical Engineering Department. Electrical Power and Machines Programme Course Title: Transmission & Distribution of Electrical Energy.		Date: Sun., 29 - 12- 2019 Time Allowed:3 hrs Full Mark: 90 Marks Final term Exam: 1 st Term. Course Code: EPM 3210. Year:3 rd 2019-2020
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This course should cover the following learning outcomes:
 a.3, a.15, b.2, b.13 c.3, c.16 d.1, d.7

Trust in God ---Be confident ----Be calm

- Exam is not a punishment or a curse.
- It is a chance to show your knowledge.
- It is the time to get the prize of your effort.

Important instructions for all students: please read carefully

- The examination consists of 5 questions in 3 papers (5 pages)
- Read the questions carefully before answering.
- Your answer should be short and precise.
- Remember to mark your answers with ordered numbers corresponding to questions.

Answer the Following Question:

(30 Marks)

Question (1):

Choose the correct answer and discuss your choosing: (Each part of question 1mark)

1. Length of the cable is doubled, its capacitance C will be:
 a) One fourth b) one half c) doubled d) unchanged

2. The main objectives of electrical power transmission is/are
 a) Transmission system must be more efficient with minimum line losses
 b) Voltage regulation of the transmission line must be zero or minimum
 c) both a and b
 d) nether a nor b

3. Advantages of higher transmission voltage is/are
 a) Power transfer capability of the transmission line is increased
 b) Transmission line losses are reduced
 c) Area of cross section and volume of the conductor is reduced
 d) all of the above

4. Maximum power transfer capability of transmission line can be increased by:
 a) Parallel transmission lines
 b) Using series capacitance
 c) Using bundled conductors
 d) all of the above

5. For flat voltage profile system, voltage regulation is:
 a) 0% b) 100% c) 50% d) any of the above.

6. Maximum power transfer in a transmission line can be obtained by:

- a) Increasing voltage level
- b) reducing reactance
- c) Either a or b
- d) none of the above

7. Ferranti effect will not occur in which of the following transmission lines:

- a) Long transmission line
- b) short transmission line
- c) medium transmission line
- d) all of the above

8. Bundled conductors in EHV transmission lines:

- a) Increase inductance
- b) increase capacitance
- c) decrease inductance
- d) decrease capacitance

9. Skin effect depends:

- a) Frequency
- b) conductivity
- c) relative permeability
- d) all of the above

10. Transmission lines are transposed to reduce:

- a) Ferranti effect
- b) skin effect
- c) proximity effect
- d) Interference with neighboring communication lines.

11. In transmission lines distribution constants are:

- a) Resistance
- b) Inductance and reactance
- c) Inductance and resistance
- d) both a and b

12. Aluminum is now most commonly employed conductor material in transmission lines than copper because:

- a) It is more conductive
- b) its tensile strength is more
- b) costlier
- d) it is cheaper and lighter

13. The presence of earth in case of overhead lines:

- a) Increase inductance
- b) increase capacitance
- c) decrease inductance
- d) decrease capacitance

14. Inductance of transmission line will decrease when:

- a) both GMD and GMR increase
- b) both GMD and GMR decrease
- c) GMD increase and GMR decrease
- d) GMD decrease and GMR increase

15. If we increase the length of the transmission line, the charging current:

- a) Increase
- b) decrease
- c) remain unaffected
- d) none of the above

16. Transmission line parameters of the short transmission line are:

- a) $1, Z, Y, 1$
- b) $1, Z, 0, 1$
- c) $1, 0, Y, 1$
- d) $Z, 0, Y, 1$

17. Surge impedance of a 3-phase, 400 kV transmission line is 400Ω . The surge impedance loading is:
- a) 400 MW b) 800MW c) 1600 MW d) 200MW
18. For transmission line which one of the following relation is true?
- b) $AD-BC=0$ b) $AD+BC=0$ c) $AD-BC=1$ d) $AD-BC=-1$
19. Phase shift occurs due to which of the following components?
- a) Inductance b) capacitance c) both a and b d) conductance
20. Find the characteristic impedance of a transmission line, if impedance is 16Ω and admittance is 0.1 mS ?
- a) 400Ω b) 160Ω c) 200Ω d) 320Ω
21. By which of the following methods string efficiency can be improved?
- a) Using long cross arm b) Grading the insulator
c) Using a guard ring d) Any of the above
22. Pin insulators are used up to:
- a) 11kV b) 33kV c) 120 kV d) any voltage level
23. Which of the following insulator is practically used for railway crossings?
- a) Pin insulator b) string insulator c) strain insulator d) all of the above
24. Which of the following statements is/are true? By increasing of temperature,
- a) Sag increase b) tension decrease c) both a and b d) neither a nor b
25. The insulation resistance of the 20 km long underground cable is $8 \text{ M}\Omega$. Other things being same, the insulation resistance of 10 km long cable will be:
- a) $8 \text{ M}\Omega$ b) $4 \text{ M}\Omega$ c) $16 \text{ M}\Omega$ d) $32 \text{ M}\Omega$
26. The most commonly used material for insulators of overhead lines is:
- a) Porcelain b) glass c) mica d) PVC
27. The insulator thickness on the conductor, in cables depends upon:
- a) Voltage b) current c) power factor d) reactive power
28. As the frequency of the system is increased, the charging MVAR:
- a) Increase b) decrease c) remain unaffected d) none of the above
29. Advantage/s of per unit system as compare to absolute system?
- a) Only one equation is required b) calculation time is less
c) memory required is less d) all of the above

30. Underground cables are laid at sufficient depth so as to

- a) Minimize temperature stresses
- b) Minimize effects of shocks and vibrations owing to passing vehicles etc.
- c) Avoid being unearthed easily owing to removal of soil
- d) Both A and C

31. Breakdown of cable insulation may occur due to

- a) Thermal instability
- b) puncture
- c) cracking
- d) any of the above

Question (2):

(15 Marks)

a) **Why** are suspension insulators preferred for high voltage power transmission? [5]

b) Four buses labeled *a*, *b*, *c* and *d* are interconnected as shown by the one-line diagram of Fig.1. Generators are connected to buses *a* and *b* supply a synchronous motor load at bus *d*. for purposes of analysis all the machines at any one bus are treated as a single machine and represented by a single e.m.f and series reactance. The reactance diagram with reactances specified in per unit is shown in Fig.2, **Simplify** the reactance diagram by eliminating the nodes at each bus. If the internal e.m.fs in per-unit stations 1, 2 and 3 are $E_1=1.5\angle 0^\circ$, $E_2=1.5\angle 15^\circ$ and $E_3=1.5\angle -36.9^\circ$. **Find** the per-unit power outputs from stations 1, 2 and **Find** the per-unit power input to station 3. [10]

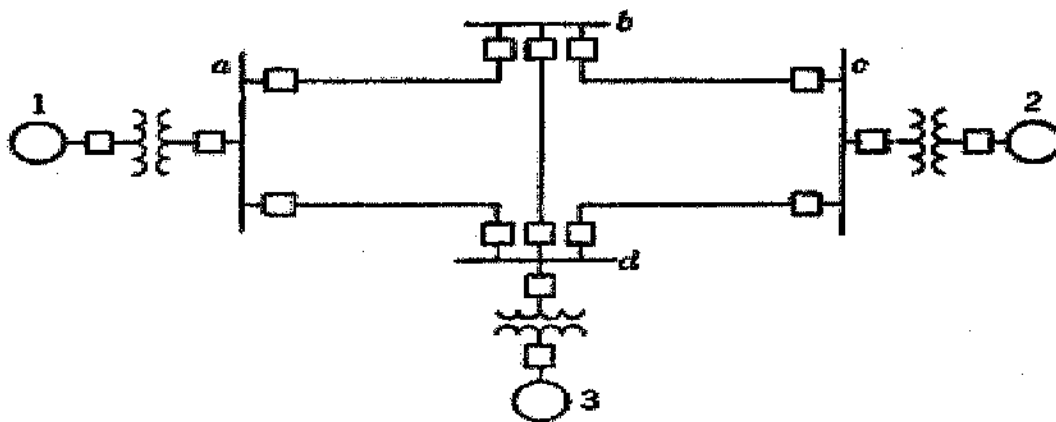


Fig. 1

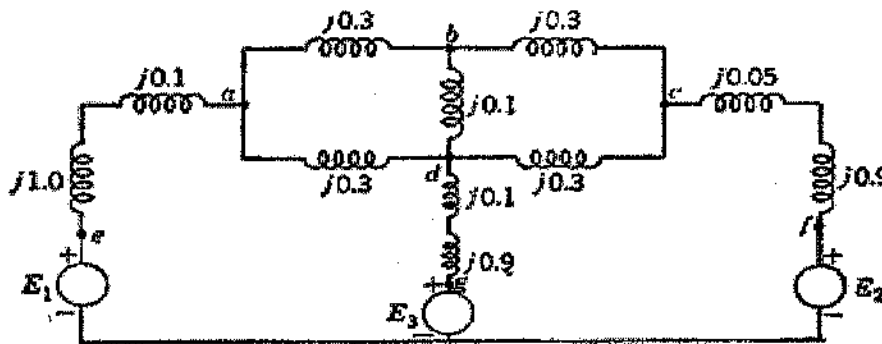


Fig. 2

Question (3):

(15 Marks)

- a) During your study of the mechanical design of transmission lines, **Demonstrate** the difference between the transfer of electric energy with single circuit and double circuit.[5]
- b) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17.5 kV, **Calculate** the line to neutral voltage. **Assume** that the shunt capacitance between each insulator and earth is $1/8^{\text{th}}$ of the capacitance of the insulator itself. **Also find** the string efficiency [10].

Question (4):

(15 Marks)

- a) **Enumerate** the different tests that are conducted on the insulators? [5]
- b) Fig.3 shows the spacing of a double circuit 3-phase overhead line. The phase sequence is ABC and the line is completely transposed. The conductor radius is 1.3 cm. **Find** the inductance per phase per kilometer.[10]

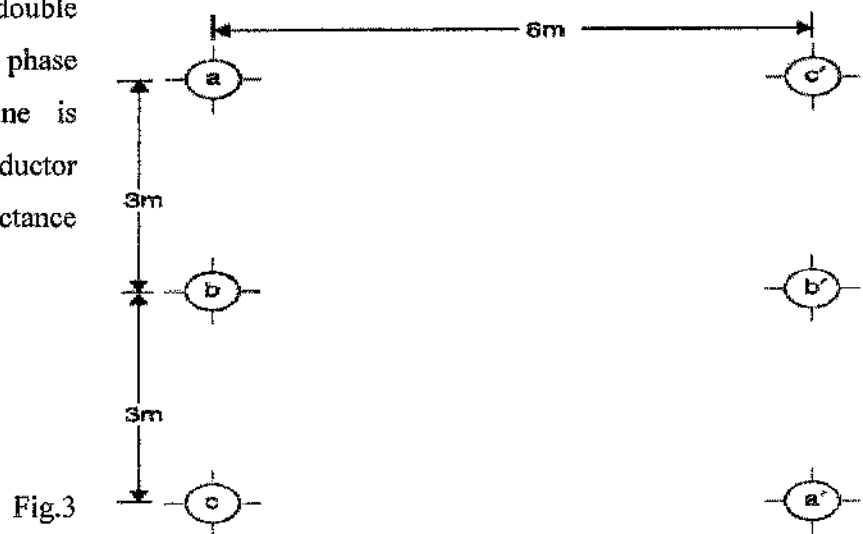


Fig.3

Question (5):

(15 Marks)

- a) **Give reasons** for the following:
- A.C.S.R conductors are preferred for transmission and distribution lines [2.5]
 - Conductors are not fully stretched between supports.[2.5]
- b) A 100 km long, 3-phase, 50 Hz transmission line has following line constants: Resistance per phase per km=0.1Ω, Reactance per phase per km=0.5Ω, Susceptance per phase per km= 10×10^{-6} S. If the line supplies load of 20 MW at 0.9 P.f lagging at 66kV at the receiving end, **Calculate** by nominal Π method: [10]
- Sending end power factor
 - Regulation
 - Transmission efficiency.

*With my best wishes
Dr.Eman Saad and committee*