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**PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF ENGINEERING**

TEST 1

Winter Semester: 2021 - 22

Course Code: EEE 212

Course Name: Transmission & Distribution.

Program & Sem: B. Tech (EEE) & VI sem

Date: 27.04.2022

Time: 01.30 PM to 2.30 PM

Max Marks: 30

Weightage: 15%

Instructions:

- (i) Read the all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts
- (iii) Scientific and Non-programmable calculators are permitted.

Part A [Memory Recall Questions]

Answer all the Questions. Each question carries one mark. (5Qx1M=5M)

- 1. The large network of conductors between the power station and the consumers can be broadly divided into two parts viz., transmission system and distribution system. Each part can be further sub-divided into two...

(C.O No 1) [Knowledge]

 - a. Primary transmission & secondary transmission
 - b. Primary distribution & secondary distribution
 - c. Generation
 - d. Both A & B

- 2. The most fundamental concept of power system is stability. The ability of an electric power system to return to its normal or stable after being disturbed. Conventionally power system stability classified as mainly;

(C.O No 1) [Knowledge]

 - a. Steady state & Transient Stability
 - b. Dynamic Stability
 - c. Static Stability
 - d. All of the above

- 3. & material is used in manufacturing of ACSR Dog Conductor. ACSR dog conductor is the British standards, and it belongs to ACSR cable, which is having Approx. Current Carrying Capacity Amp at 450C amb. temp is 300 Amps.

(C.O No 2) [Knowledge]

 - a. Aluminum & Steel
 - b. Aluminum & Aluminum
 - c. Aluminum & Alloy
 - d. Aluminum & Copper

- 4. Identify the which are not the energy storing elements considered for the transmission line model

(C.O No 2) [Knowledge]

 - a. Resistance, Inductance, Capacitance
 - b. Inductance & Capacitance

- c. Resistance & Capacitance
- d. Resistivity, conductivity & Permeability

5. Magnetic field intensity will be different within and outside the conductor as the flux linkages due to internal flux and external flux are different. Thelaw is used to compute the magnetic field intensity of the conductor. (C.O No 2) [Knowledge]
- a. Gauss's
 - b. Amperes'
 - c. Lenz's Law
 - d. Faradays

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries SEVEN AND HALF marks. (2Qx7.5M=15M)

6. The main function of a Transmission line is to transfer the bulk amount of power to load centers and industrial users up to primary distribution. A transmission system consists of Structures, wires, switching, and conversion stations. It forms a bone of the power system which connects generating station with the load points. Transmission systems are interconnected due to economic, security, and reliability reasons. Identify and list the various types of transmission system based on source and also list out the advantages and disadvantages of each system. (C.O No 1) [Comprehension]
7. A transmission line has three constants R, L and C distributed uniformly along the whole length of the line. The resistance and inductance form the series impedance. The capacitance existing between conductors for 1-phase line or from a conductor to neutral for a 3-phase line forms a shunt path throughout the length of the line. Therefore, capacitance effects introduce complications in transmission line calculations. Depending upon the manner in which capacitance is taken into account; the overhead transmission lines are classified as a. Short transmission lines, b. Medium transmission lines, & c. Long transmission lines. It is proposed to transfer electrical power from Karnataka Power Corporation Ltd., (KPCL) Gas Power plant Yelhanka to Presidency university, identify and suggest what type of transmission line can be used and also obtain the mathematical model for the suggest system with necessary diagram. (C.O No 2) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The question carries TEN marks. (1Qx10M=10M)

8. A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Fig. 1. The conductor diameter is 1.25 cm. If the line length is 100 km. Identify and list the unknown parameters that could be found from the given data and compute the same. (C.O No 2) [Comprehension]

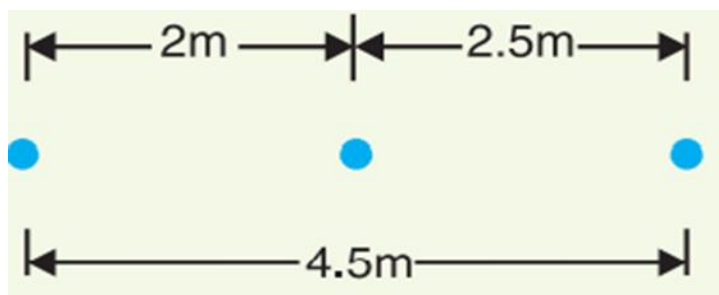


Fig. 1

(C.O. No. 3) [Knowledge]

- e. pin type
- f. suspension type
- g. strain insulator
- h. All of the above

5. The suspension type insulators are generally used with..... As the conductors run below the earthed cross-arm of the tower, therefore, this arrangement provides partial protection from lightning (C.O. No. 3) [Knowledge]

- e. steel towers
- f. RCC poles
- g. Wooden poles
- h. None of the above.

Part B [Thought Provoking Questions]

Answer both the Questions. Each question carries 7.5 marks. (2Qx7.5M=15M)

6. The towers of height 30 m and 90 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg, what may be the minimum clearance of the conductor and water and clearance mid-way between the supports. Weight of conductor is 1.5 kg/m. Bases of the towers can be considered to be at water level. (C.O. No. 2) [Comprehension]

7. An overhead line may be used to transmit or distribute electric power. The successful operation of an overhead line depends to a great extent upon the mechanical design of the line. While constructing an overhead line, it should be ensured that mechanical strength of the line is such so as to provide against the most probable weather conditions. List out the various components that are associated with overhead transmission line construction. List out the desirable properties of Insulators and also list the various types of insulators used in transmission & distribution of electrical power.

(C.O. No. 3) [Comprehension]

Part C [Problem Solving Questions]

Answer the Question. The question carries TEN marks. (1Qx10M=10M)

8. 9:A (medium) single phase transmission line 100 km long has the following constants :
Resistance/km = 0.20Ω ; Reactance/km = 0.75Ω
Susceptance/km = 13.5×10^{-6} siemen ; Receiving end line voltage = 66,000 V
Assuming that the total capacitance of the line is localized at the receiving end alone, determine;
a. The sending end current
b. The sending end voltage
c. Voltage Regulation and
d. Supply power factor.

The line is delivering 15,500 kW at 0.85 power factor lagging. Draw the phasor diagram to illustrate your calculations. (C.O.No. 2) [Comprehension]

k. Resistance & Capacitance

l. Resistivity, conductivity & Permeability

v. The cost of pin type insulator increases rapidly as the working voltage is increased. Therefore, this type of insulator is not economical beyond 33 kV. For high voltages (>33 kV), it is a usual practice to use insulators..... (C.O. No. 3) [Knowledge]

- i. Suspension type
- j. Pin type
- k. Strain type
- l. Shackle type

vi. The successful operation of an overhead line depends to a considerable extent upon the proper selection of insulators. There are several types of insulators but the most commonly used are..... (C.O. No. 3) [Knowledge]

- a. pin type
- b. suspension type
- c. strain insulator and shackle insulator
- d. All of the above

vii. The satisfactory operation of a cable depends to a great extent upon the characteristics of insulation used. In general, the insulating materials used in cables should have the following properties; (C. O. No. 4) [Knowledge]

- a. High insulation resistance to avoid leakage current
- b. High dielectric strength to avoid electrical breakdown of the cable.
- c. Low cost so as to make the underground system a viable proposition
- d. All of the above

viii. Electrical cables are the nerves of any electrical network. Cables consist of a huge percentage of capital investment in any electrification project. And, they are the most vulnerable to failures too. Most of the cable failures could be attributed to improper selection are; (C. O. No. 4) [Knowledge]

- a. Voltage Rating
- b. Type of Conductor
- c. Continuous Current Rating
- d. All of the above

ix. The part of power system which distributes electric power for local use is known as distribution system. It generally consists of (C. O. No. 5) [Knowledge]

- a. Feeders
- b. Distributors
- c. Service mains
- d. All of the above

x. Secondary distribution system is the part of a.c. distribution system which includes the range of voltages at which the ultimate consumer utilises the electrical energy delivered to him. The secondary distribution employs V, 3-phase, 4-wire system. (C. O. No. 5) [Knowledge]

- a. 400/230 V
- b. 33kV/66 Kv
- c. 110/440 V
- d. 220kV/110Kv

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries TEN marks.

(4Qx10M=40M)

- It is required to transfer the generated electrical power from the Raichur thermal power plant (RTPS) to Bengaluru. Kindly suggest what type of transmission system suits to transfer power from RTPS to Bengaluru and also list out the various important factors that are need to be considered while deciding the transmission system.
(C.O. No. 2) [Comprehension]
- When an alternating potential difference is applied across two conductors whose spacing is large as compared to their diameters. There is no apparent change in the condition of atmospheric air surrounding the wires if the applied voltage is low. When the applied voltage exceeds a certain value, called critical disruptive voltage. The conductors are surrounded by a faint violet glow called corona. List out the various phenomenon of corona is accompanied, list out the various factors affecting the corona and describe them in brief.
(C.O. No. 3) [Comprehension]
- The cable generally comprises of the conductor, insulation material, bedding, beading/ armoring, and outer sheath etc. Although, the armoring and outer sheath takes care of the physical safety of cable, adequate care has to be taken by cable manufacturers during manufacturing of the cable. With neat diagram explain the construction details of 3 core underground cable.
(C.O. No. 4) [Comprehension]
- The electrical energy produced at the generating station is conveyed to the consumers through a network of transmission and distribution systems. The part of power system which distributes electric power for local use is known as distribution system. In general, the distribution system is the electrical system between the sub-station fed by the transmission system and the consumer's meters. It generally consists of feeders, distributors and the service mains. List out and explain in brief various connections of schemes of distribution system with necessary diagram. (C.O. No. 5) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Question. The question carries TEN marks.

(4Qx10M=40M)

- Power is transferred from Bengaluru to Mysuru through a 3-phase, which is having line length is 143.6 km long; supply frequency is 50-Hz. The transmission line has following line constants:
Resistance/phase/km = 0.1Ω
Reactance/phase/km = 0.5Ω
Susceptance/phase/km = $10 \times 10^{-6} S$
If the line supplies load of 20 MW at 0.9 p.f. lagging at 66 kV at the receiving end. Identify the unknown parameters and that could be found from the given data and compute the same. Assume it's proposed to transfer power by using medium transmission line (nominal π method).
(C.O. No. 2) [Comprehension]
- Two towers of height 40 m and 30 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 300 m. If the tension in the

conductor is 1590 kg, find the clearance of the conductor at a point mid-way between the supports. Weight of conductor is 0.8 kg/m. Bases of the towers can be considered to be at the water level. (C.O. No. 2) [Comprehension]

8. In a 33 kV overhead line, there are three units in the string of insulators. If the capacitance between each insulator pin and earth is 11% of self-capacitance of each insulator, find (i) the distribution of voltage over 3 insulators and (ii) string efficiency. (C.O. No. 3) [Comprehension]

9. Two tram cars (A & B) 2 km and 6 km away from a sub-station return 40 A and 20 A respectively to the rails. The sub-station voltage is 600 V d.c. The resistance of trolley wire is 0.25 Ω /km and that of track is 0.03 Ω /km. Calculate the voltage across each tram car. (C.O. No. 5) [Comprehension]



Fig.2.Tram car