Code No: **R31023** **R10** **Set No. 1**

III B.Tech I Semester Supplementary Examinations, October/November - 2017
POWER SYSTEMS-II
(Electrical and Electronics Engineering)

Time: 3 hours **Max. Marks: 75**

Answer any FIVE Questions
All Questions carry equal marks

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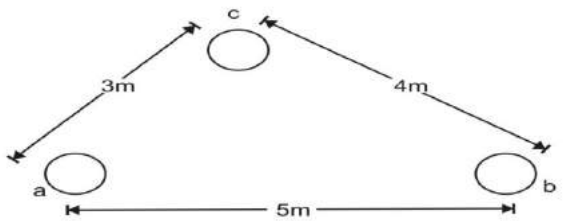
1 a) What are the various types of conductors used for transmission system? Discuss them briefly.

b) Determine the inductance and reactance of each phase of a three-phase 50Hz overhead high-tension line (HTL) which has conductors of 2.2cm diameter. The distance between the three-phases are (i) 5cm between a and b, (ii) 4m between b and c and (iii) 3m between c and a as shown in below Figure. Assume that the phase conductors are transposed regularly.



2 a) Describe how transmission lines are classified? Explain their characteristics.

b) A 3-phase, 50Hz, 200km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1 ohm, 0.5 ohm and . 3×10^{-6} mhos per km per phase .If the line delivers 60MW at 132 kV and 0.9 p.f. lagging, determine the sending end voltage and current. Assume a Nominal-π circuit for the line.

3 a) Explain the interpretation of the long line equations

b) A three – phase overhead transmission line has series impedance per phase of $220\angle70^0$ ohms and a total shunt admittance of $0.03\angle90^0$ siemen per phase. The line delivers a load of 120MW at 0.88 pf lagging and 220kV between the lines. Calculate the sending-end voltage and current by the rigorous method.

4 a) Discuss the behavior of a travelling wave when it reaches the end of short circuited line. Draw diagrams to show voltage and current of the line before and after the wave reaches the end.

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b) A transmission line has an inductance of 0.92 H/km and a capacitance of 0.008 μF/km. This overhead line is connected to an underground cable having an inductance of 0.16 mH/km and a capacitance of 0.19 μF/km. If a surge of crest 110 kV travels in the cable towards its junction with the line, find the surge transmitted along the line.

5 a) Discuss why the receiving-end voltage of an unloaded long line may be more than its sending-end voltage.

b) In a three overhead line, the conductors have each an overall diameter of 3.0 cm and are arranged in delta formation. Assuming a critical voltage of 260 kV between lines and an air density factor of 0.8. Find the minimum spacing between conductors allowable, assuming fair weather conditions and breakdown voltage of 21.21(rms) kV/cm for smooth conductors.

6 a) What is a sag template? Explain how this is useful for the location of towers and the stringing of power conductors.

b) An overhead line is erected across a span of 200 m on level supports. The conductor has a diameter of 1.25 cm and a dead weight of 1.09 kg/m. The line is subjected to wind pressure of 37.8 kg/sq.m of the projected area. The radial thickness of ice is 1.25 cm. Calculate the sag, (i) in an inclined direction, (ii) in a vertical direction. Assume a maximum working stress of 1,050 kg/sq cm. One cubic meter of ice weighs 913.5 kg.

7 a) What is guard ring which is being used in the suspension string type insulator? Deduce the relation for determining the capacitance formed by the ring.

b) The self capacitance of each unit in a string of three suspension insulators is C. The shunting capacitance of connecting metal work of each insulator to earth is 0.25 C while for line it is 0.3 C. Determine the following
(i)the voltage across each insulator as the percentage of the line voltage to earth and
(ii)String efficiency.

8 a) Briefly discuss the various methods of voltage control.

b) A 3 phase, 50 Hz, 415 V motor develops 120 H.P., the p.f. being 0.707 lag and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and p.f. is raised to 0.95 lag. Each of the capacitance units is built of 4 similar 100 V capacitors. Determine the capacitance of each capacitor.

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