III B. Tech I Semester Supplementary Examinations, August - 2021

POWER SYSTEMS–II

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART –A **(14 Marks)**

1. a) Give the relation for the GMR of a bundle consisting of 4 sub conductors. [2M]
   b) How will you classify the transmission lines? [2M]
   c) What is the rigorous solution method required for long lines? [2M]
   d) What is the difference between travelling waves and Standing Waves? [3M]
   e) What is Ferranti effect? [2M]
   f) What are the factors which affect Sag? [3M]

PART –B **(56 Marks)**

2. a) Derive an expression for the inductance of a symmetrical three phase line. What is meant by the term equivalent spacing? State its significance. [7M]
   b) Calculate the inductance and capacitance per km of a line consisting of solid conductors of 30 mm diameter placed at the corners of a triangle with sides 3, 4 and 5 meters. The conductors are adequately transposed. [7M]

3. A three phase 132 KV transmission line is connected to a 50 MW load at a power factor of 0.88 lagging. The line constants of the 80 Km long line are $Z = 96\angle 78^0\ \Omega$ and $Y = 0.001\angle 90^0$ S. Using nominal T- circuit representation, calculate: i) the A, B, C and D constants of the line; ii) Sending end voltage; iii) sending end current; iv) sending end power factor; v) efficiency of transmission. [14M]

4. In a three phase line with 132 KV at the receiving end the following are the constants of the transmission: $A = D = 0.98\angle 3^0$, $B = 110\angle 75^0\ \Omega$, $C = 0.0005\angle 88^0$ S. If the load at the receiving end is 50 MVA at 0.8 lagging power factor, determine the value of Sending end voltage. [14M]

5. a) Starting from first principles show that surges behaves as travelling waves. Find expressions for Surge impedance and wave velocity. [7M]
   b) Discuss the behavior of a travelling wave when it reaches the end of: [7M]
      i) open circuited; ii) short circuited transmission line.
      Draw diagrams to show voltage and current on the line before and after the wave reaches the end.
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6. a) Explain clearly the 'skin effect' and 'proximity effect' when referred to overhead lines. [7M]
   b) Explain the different methods of reducing corona losses. [7M]

7. a) Explain the effect of ice and wind on the transmission line conductor. [7M]
   b) A transmission line conductor at a river crossing is supported from two towers at heights of 50 meters and 80 meters above water level. The span length is 330 meters. Weight of the conductor is 0.90 kg/meter. Determine the clearance between the conductor and water at a point midway between towers if the tension in the conductor is 1950 kg. [7M]

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