Code No: D0705 **R09**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
M.Tech II - Semester Examinations, March/April 2011
EXTRA HIGH VOLTAGE TRANSMISSION
(ELECTRICAL POWER SYSTEMS)

Time: 3hours **Max. Marks: 60**

Answer any five questions
All questions carry equal marks

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1. a) What are the important and useful conclusions can be drawn for preliminary understanding of trends relating to power-handling capacity of a.c. transmission lines and line losses.
   b) A power of 2000 MW is to be transmitted from a super thermal power station in Central India over 800 km to Delhi. Use 400 kV and 750 kV alternatives. Suggest the number of circuits required with 50% series capacitor compensation, and calculate the total power loss and loss per km.
   c) What are the different mechanical considerations in line performance? [12]

2. a) Derive the expression for Single-phase line capacitance calculation. And Multi-conductor line for calculation of Maxwell's potential coefficients.
   b) The configurations of some e.h.v. lines for 400 kV to 1200 kV are given. Calculate *req* for each.
   (*a*) 400 kV : $N = 2$, $d = 2r = 3.18$ cm, $B = 45$ cm
   (*b*) 750 kV : $N = 4$, $d = 3.46$ cm, $B = 45$ cm
   (*c*) 1000 kV : $N = 6$, $d = 4.6$ cm, $B = 12\ d$
   (d) 1200 kV : $N = 8$, $d = 4.6$ cm, $R = 0.6$ m [12]

3. a) Explain the audible Noise frequency spectra for ac and dc transmission lines. Also give the limits for audible noise.
   b) Surface voltage Gradient on conductors under
   i)Maximum Surface Voltage Gradients for $N \geq 3$
   ii) Mangoldt (Markt-Mengele) Formulae [12]

4. a) Explain the corona loss formulae on Based on Voltages and Voltage Gradients?
   b) How the VOLTAGE CONTROL is done Using Synchronous Condensers? [12]

5. a) Explain how the Harmonic injection by TCR into a high-voltage system through 2-winding and 3-Winding transformers.
   b) A 100 MVA 230 kV 50 Hz transformer has *xt* = 12% and is connected to a line 200 km long which has an inductance of 1 mH/km. The filter, connected to the l.v. 33 kV side of the transformer, is required to suppress the 5-th harmonic generated by the TCR to 1% of *In*. Calculate the value of filter capacitor if the filter inductance used is 2 mH [12]

6. Explain how Harmonics Injected into Network by TCR under
   a) Harmonic Injection by TCR in to high voltage system.
   b) Connection of TCR to Δ and Y connected transformer windings.
   c) Voltage and current wave forms for $\alpha=90°$, $\alpha>90°$ for calculations of harmonics. [12]

7. Derive the Line capacitance calculation for
   i) two conductor line
   ii) capacitance of multi conductor lines
   iii) potential coefficients for bundled conductor lines [12]

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8. a) Give Power-Handling Capacity and Line Loss for different Transmission lines.
   b) Among HVAC and DC Transmission which one is best transmission, also mention the advantages and disadvantages of it. [12]

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