Indian Institute of Technology Patna
Department of Electrical Engineering
EE3101-Power Systems-I
Lab Quiz

Time: 1 Hour | Autumn 2026 | Max Marks: 10

All questions are compulsory

1. Using shunt capacitors, the power factor of a 3-phase, 4 kV induction motor(drawing 390 kVA at 0.77 pf lag) is to be corrected to 0.85 pf lag. Find the line current of the capacitor bank, in A.

$P_{motor} = 300.3$ KW

$Q_{motor} = 246.84$ KVAr

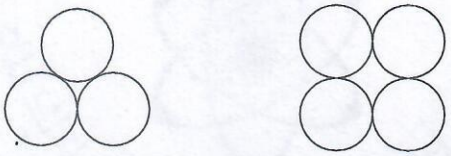
To get 0.85 pf,

$Q_c = -62.73$ KVAr

$I_{Cap} = \frac{62.73}{\sqrt{3} \times 4}$

$I_{Cap} = 9.05$ A

2. Determine the geometric mean radius (GMR) of the following configurations of a conductor with each strand of radius *r*.



(a) (b)

$GMR_L = 1.46\,r$

$GMR_L = 1.59\,r$

$GMR_L = 1.72\,r$

$GMR_L = 1.83\,r$

3. A three-phase 50 Hz, 400 kV transmission line is 300 km long. The line inductance is 1 mH/km per phase,and the capacitance is 0.01 μF/km per phase. The line is under open circuit condition at the receiving end and energized with 400 kV at the sending end. Find the receiving end line voltage in kV using the nominal -π model.

$A = 0.9556$

$V_{R\,phase} = 241.67$ kV

$V_{R\,L-L} = 418.6$ kV

4. A three-phase 50 Hz, 400 kV transmission line is 300 km long. The line inductance is 1 mH/km per phase,and the capacitance is 0.01 μF/km per phase. Find the surge impedance loading of the line. Use the nominal-π model.

$Z_c = 316.2\,\Omega$

$P_{SIL} = 505.96$ MW

5. A lossless transmission line having surge impedance loading (SIL) of 2280 MW is provided with a uniformly distributed series capacitive compensation of 30 %. Find the SIL of the compensated line.

$$P_{SIL_{Comp}} = \frac{P_{SIL\ uncomp}}{\sqrt{0.7}}$$

$$= 2725.1 \text{ MW}$$