Registration No.: | | | | | | | | | | |

Total Number of Pages: 02

Course: B.Tech
Sub_Code: EEPC3002

5th Semester Regular Examination: 2025-26
SUBJECT: POWER SYSTEM - I
BRANCH(S): EEE, ELECTRICAL, EE
Time: 3 Hours
Max Marks: 100
Q.Code: U126

Answer Q1 (Part-I) which is compulsory, any eight from Part-II and any two from Part-III.
The figures in the right-hand margin indicate marks.

Part-I

Q1 **Answer the following questions:** **(2 x 10)**

a) Define a power system. What are its major components?
b) What is the purpose of line transposition?
c) What is a bundled conductor? State its advantages.
d) What is the significance of the equivalent π-model of a line?
e) State two disadvantages of corona.
f) What are the factors affecting corona formation?
g) What is a stringing chart?
h) The ABCD constants of a 3-phase transmission line are A = D = 0.8 ∠1° ; B = 170 ∠85° ; C = 0.002 ∠90.4° mho. The sending end voltage is 400 kV. Find the receiving end voltage under no load condition
i) What is "earth resistance"?
j) What is most common generating voltage in India? Why are the generating voltages stepped up before transmission of power over long distances?

Part-II

Q2 **Only Focused-Short Answer Type Questions- (Answer Any Eight out of Twelve)** **(6 x 8)**

a) Write a short note on- Thermal Power Plant?
b) Derive the expression of the inductance of the single-phase single wire line?
c) Explain the concept of Geometric Mean Distance in calculating the inductance with suitable examples. (Bundled conductor Self GMD and Self GMR).
d) Derive the expression of the capacitance of the three-phase unsymmetrical spaced transposed overhead transmission line?
e) Explain the Skin effect and Proximity effect. Explain why the AC resistance is higher than DC resistance.
f) Draw the phasor diagram of the short transmission line and determine the condition for the maximum and zero voltage regulation short transmission line.

g) Explain the 'Ferranti effect' in the transmission line along with its phasor diagram.

h) Discuss about the reactive power compensation or VAR compensation.

i) What is surge impedance loading of a transmission line?

j) Derive the expression for Sag of a line supported between two supports of unequal height.

k) Differentiate between the AC and DC Distribution system?

l) What is Kelvin's law and its limitation?

Part-III

Only Long Answer Type Questions (Answer Any Two out of Four)

Q3 **a)** Describe the evolution of power systems from early days to the present scenario. Highlight the role of renewable energy and smart grid technologies. **(8)**

b) Explain surge impedance loading (SIL). Derive the formula and discuss its importance in transmission line design. **(8)**

Q4 Determine the inductance of a 1-phase transmission line having the following arrangement of conductors (Fig. 1). One circuit consists of three wires of 2 mm dia each and the other circuit two wires of 4 mm dia each. **(16)**

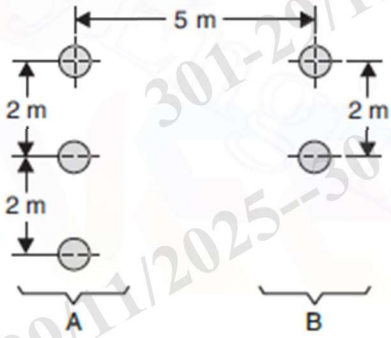

Fig. 1

Q5 Determine the efficiency and regulation of a 3-phase, 100 km, 50 Hz transmission line delivering 20 MW at a p.f. of 0.8 lagging and 66 kV to a balanced load. The conductors are of copper, each having resistance 0.1 ohm per km, 1.5 cm outside dia, spaced equilaterally 2 meters between centers. Neglect leakance and use (i) nominal-*T*, and (ii) nominal- π method. **(16)**

Q6 An overhead line at a river crossing is supported from two towers of heights 30 meters and 90 meters above water level with a span of 300 meters. The weight of the conductor is 1 kg/meter and the working tension is 2000 kg. Determine the clearance between the conductor and the water level mid-way between the tower. **(16)**