**Name:**

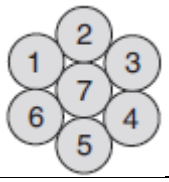
**Enrolment No:**

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
**End Semester Examination, December 2022**

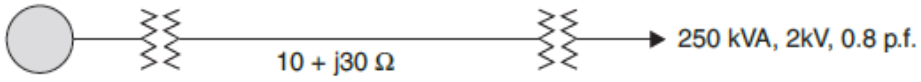
**Course: Electrical Power System-I** **Semester: III**
**Program: B.Tech (RSEE)** **Time: 03 hrs.**
**Course Code: EPEG2018** **Max. Marks: 100**

**Instructions: Read the instructions provided for every question properly before attempting the answer. Use of calculator is permitted.**

**SECTION A**
**(5Qx4M=20Marks)**

| S. No. | | Marks | CO |
|---|---|---|---|
| Q 1 | Briefly describe the major components of the power system. | **4** | **CO1** |
| Q 2 | Determine the critical disruptive voltage and corona loss for a 3-phase line operating at 110 kV which has conductor of 1.25 cm dia arranged in a 3.05 metre delta. Assume air density factor of 1.07 and the dielectric strength of air to be 21 kV/cm. | **4** | **CO2** |
| Q 3 | What is corona loss in transmission system? | **4** | **CO4** |
| Q 4 | Explain with a suitable graph the behavior of cost versus transmission distance for both ac and dc type system. | **4** | **CO1** |
| Q 5 | A conductor consists of seven identical strands each having a radius of r. Determine the factor by which r should be multiplied to find the self GMD of the conductor.   | **4** | **CO5** |

**SECTION B**
**(4Qx10M= 40 Marks)**

| | | | |
|---|---|---|---|
| Q 6 | Determine the voltage at the generating station and the efficiency of transmission for the following 1-phase system:   Transformer ratio 2 kV/11 kV. The resistance on l.v. side = 0.04 ohm and h.v. side 1.3 ohm. Reactance on l.v. and h.v. side is 0.125 ohm and 4.5 ohm. | **10** | **CO5** |

| | | | |
|---|---|---|---|
| Q 7 | A 400 V, 3-phase 4-wire service mains supplies a star connected load. The resistance of each line is 0.1 ohm and that of neutral 0.2 ohm. The load impedances are $Z_R = (6 + j9)$, $Z_Y = 8$ ohms and $Z_B = (6 – j8)$. Calculate the voltage across each load impedance and current in the neutral. Phase sequence RYB. | **10** | **CO3** |
| Q 8 | Define Ferranti effect. Describe in detail the explanation of Ferranti-effect by considering lumped impedance and net reactive power flow on the line. | **10** | **CO1** |
| Q 9 | Prove that the relation between the parameters of a two-terminal pair network is AD-BC = 1.<br>OR<br>Derive the expression of total flux linkage due to current flowing in a 1-phase two-wire transmission line. | **10** | **CO2** |
| **SECTION-C<br>(2Qx20M=40 Marks)** | | | |
| Q 10 | (a) The line-to-ground voltages on the high voltage side of a step-up transformer are 100 kV, 33 kV and 38 kV on phases a, b and c respectively. The voltage of phase a leads that of phase b by 100° and lags that of phase c by 176.5°. Determine analytically the symmetrical components of voltage.<br>(b) The line currents in amperes in phases a, b and c respectively are 500 + j150, 100 – j600 and – 300 + j600 referred to the same reference vector. Find the symmetrical component of currents. | **10+10** | **CO4** |
| Q 11 | 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 metres between centres. Neglect leakance and use (i) nominal-T, and (ii) nominal- π method.<br>OR<br>Derive the expression of % regulation and efficiency for a medium transmission line for both nominal-T and nominal-π configurations. | **20** | **CO3** |