

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April-May 2016

B. Tech in EE Engineering, Semester IV

Roll No.....

EE402: TRANSMISSION & DISTRIBUTION OF
ELECTRICAL POWER

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Objective type multiple choice questions (10 questions @ 1 mark) 10

- i. The values of A, B, C and D constants for short transmission line are respectively
(a) Z, 0, 1 and 1 (b) 0, 1, 1 and Z
(c) 1, Z, 0 and 1 (d) 1, 1, Z and 0
- ii. When is the Ferranti effect on long over head lines experienced?
(a) The lines are lightly loaded (b) The lines are heavily loaded
(c) The lines are fully loaded (d) The power factor is unity
- iii. Which of following properties has got higher value for aluminium as compared to copper?
(A) Melting point (B) Specific gravity
(C) Electrical resistivity (D) Thermal conductivity.
- iv. The Conductors used in high tension overhead lines are:
(a) Solid (b) Stranded
(c) Both a and b (d) None
- v. The corona is affected by which of the following?
(a) Size of the conductor (b) Shape of the conductor
(c) Surface condition of the conductor (d) All of the above
- vi. For a 50 Hz 300 km long transmission line $V_S = 145 \angle 4.9^\circ$ kV, $I_S = 0.164 \angle -36.9^\circ$ kA.
What is the sending end power?
(a) 82.9 MW (b) 43.8 MW
(c) 75.4 MW (d) 53.2 MW
- vii. What does the bedding on the cable consists of?
(a) Jute strands (b) Hessian type
(c) Paper tape compounded with a fibrous material (d) Any of these

- viii. With the presence of earth in case of overhead lines:
- Capacitance of the line decreases and Inductance increases
 - Capacitance of the line increases and Inductance increases
 - Capacitance and Inductance of the line increases
 - Only Capacitance of the line Increases
- ix. The safety factor of insulators is defined as ratio of
- Flash over voltage to puncture voltage
 - Current to voltage
 - Puncture voltage to flash over voltage
 - Current to power
- x. Which among these is the fundamental economical principle which influences the design of transmission lines?
- Economical choice of conductor size
 - Economical choice of transmission voltage
 - Both (a) and (b)
 - Economic choice of transmission line length.

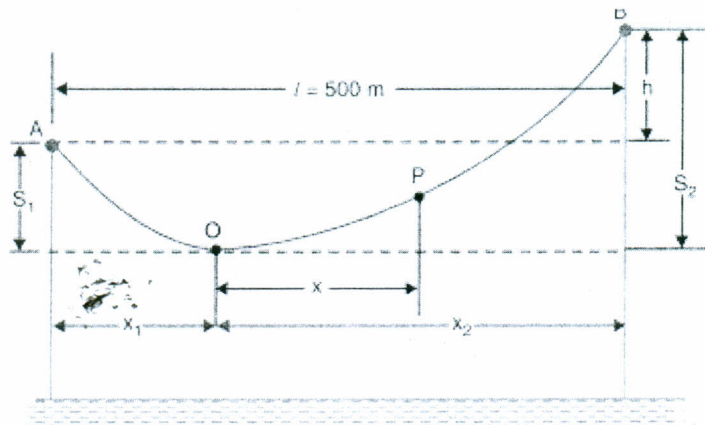
Q.2 Short answer type questions (4 questions @ 2.5 marks) 10

- Why cables are not used for long distance transmission?
- Why protective covering is done with cables?
- Why is ground wire used in equipment grounding?
- What is the function of sheath in a cable?

Q.3A Explain the effect of high voltage on volume of copper and on efficiency. 05

Q.3B Explain the classification of lines based on their length of transmission. 05

Q.4A The towers of height 30 m and 90 m respectively support a transmission line conductor at water crossing. The horizontal distance between the towers is 500 m. If the tension in the conductor is 1600 kg, find the minimum clearance of the conductor and water and clearance midway between the supports. Weight of conductor is 1.5 kg/m. Bases of the towers can be considered to be at water level. 05



Q.4B Describe with the neat sketch, the construction of a 3 core cable. 05

Q.5A Derive expressions for sag and tension in a power conductor strung between two supports at equal heights, taking into account the wind and ice loading also. 05

Q.5B Briefly explains about various types of cables used in the underground system. 05

- Q.6A State and prove Kelvin's law for size of conductor for transmission. Discuss its limitations. 05
- Q.6B In a 3-unit insulator, the joint to tower capacitance is 20% of the capacitance of each unit. By how much should the capacitance of the lowest unit be increased to get a string efficiency of 90%. The remaining two units are left unchanged. 05

OR

- Q.6B Explain the following terms with reference to corona : (i) Critical disruptive voltage 05
(ii) Visual critical voltage (iii) Power loss due to corona
- Q.7A Explain the Ferranti effect with a phasor diagram and its causes. 05
- Q.7B Explain any two methods of grading of cables with necessary diagrams. 05

OR

- Q.7B Derive the expression for insulation resistance, capacitance and electric stress in a single core cable. Where is the stress maximum and minimum? 05
- Q.8 Deduce an expression for line to neutral capacitance for a 3-phase overhead transmission line when the conductors are 10
(i) symmetrically placed
(ii) Asymmetrically placed, but transposed
- Q.9A Explain clearly the skin effect and the proximity effects when referred to lines. 10
- Q.9B A 132 KV, 50 Hz, 3-phase transmission line delivers a load of 50 MW at 0.8 p.f. lagging at the receiving end. The generalized constants of the transmission line are: 10
 $A = D = 0.95 \angle 1.4^\circ$, $B = 96 \angle 78^\circ$; $C = 0.0015 \angle 90^\circ$. Find the regulation of the line and charging current. Use Nominal-T method.

OR

- Q.9B Calculate the most economical diameter of a single core cable to be used on 132kV, 3 phase system. Find also the overall diameter of the insulation; if the peak permissible stress does not exceed 60kV/cm. Also derive the formula used. 10