

Code.No: RR310203

RR

SET-1

III B.TECH – I SEM EXAMINATIONS, NOVEMBER - 2010
POWER SYSTEMS - II
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Time: 3hours**Max.Marks:80**

Answer any FIVE questions
All questions carry equal marks

1. Using the nominal T method, find the sending end voltage and voltage regulation of a 300KM, 3-phase, 50Hz, transmission line delivering 30MVA, at 0.8 power factor to a balanced load at 132KV. The line conductors are spaced equilaterally 3m apart. The conductor resistance is $0.11 \Omega / Km$ and its effective diameter is 1.5cm. Neglect leakage. [16]
- 2.a) What is string efficiency of an overhead line insulators. Give its significance.
 b) Determine the corona loss for a 3-phase 220KV, 50Hz, 180Km long line, with conductor diameter 1.025Cm, 3m delta spacing, air temperature $26.67^{\circ}C$ and pressure of 73.15cm. [8+8]
3. An overhead conductor consists of 9 strands of silicon-bronze having an ultimate strength of $9000kg/cm^2$ and an area of $2.5cm^2$ when erected between supports 600m apart and having a 25m difference in level, determine the vertical sag which must be allowed so that the factor of safety shall be 5. Assume the wire weights 2kg/m, ice loading 1kg/m and wind loading is 1.95kg/m. [16]
- 4.a) What do you mean by grading of cables? Explain briefly different types of grading of cables.
 b) A single core cable 5Km long has an insulation resistance of $0.5M\Omega$. The core diameter is 15mm and the diameter of the cable over the insulation is 50mm. Calculate the resistivity of the insulating material. Derive the formula used. [8+8]
- 5.a) What is the effect of transformer operation on supply power factor? Explain
 b) A $3-\phi$, 50Hz, 440V motor develops 120 H.P. the power factor being 0.8 lagging and efficiency 90%. A bank of capacitors is connected in star across the supply terminals and power factor raised to 0.98 lagging. Each of the capacitance unit across line to line is built of four similar capacitors. What is the voltage rating and capacitance of each capacitor. [8+8]
6. What are the different types of series connected devices used for voltage control in a complete power system network. Explain them with the aid of neat sketches. [16]
- 7.a) what are the different types of faults that take place in a power system and which one is more severe? Explain
 b) The symmetrical components of a set of unbalanced three phase voltages are $V_{ao} = 0.8\angle 45^{\circ}$, $V_{a1} = 1.2\angle 60^{\circ}$ and $V_{a3} = 1.5\angle -310^{\circ}$. Obtain the original unbalanced Phasors and show the vector diagram relationship. [8+8]

- 8.a) Derive the expression for sequence impedances and draw the sequence impedance diagrams for a 3- ϕ synchronous generator whose stator winding neutral is solidly grounded.
- b) A 25MVA, 11KV, 3- ϕ 50Hz generator has its neutral earthed through a 5% reactor. It is in parallel with another identical generator having neutral earthed through a 5% reactor. Each generator has a positive, negative and zero sequence reactances are 25%, 15% and 20% respectively. If a line to ground short circuit occurs in the common bus bar, determine the fault current. [8+8]

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1. An overhead conductor consists of 9 strands of silicon-bronze having an ultimate strength of $9000\text{kg}/\text{cm}^2$ and an area of 2.5cm^2 when erected between supports 600m apart and having a 25m difference in level, determine the vertical sag which must be allowed so that the factor of safety shall be 5. Assume the wire weights $2\text{kg}/\text{m}$, ice loading $1\text{kg}/\text{m}$ and wind loading is $1.95\text{kg}/\text{m}$. [16]
- 2.a) What do you mean by grading of cables? Explain briefly different types of grading of cables.
 b) A single core cable 5Km long has an insulation resistance of $0.5\text{M}\Omega$. The core diameter is 15mm and the diameter of the cable over the insulation is 50mm. Calculate the resistivity of the insulating material. Derive the formula used. [8+8]
- 3.a) What is the effect of transformer operation on supply power factor? Explain
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- 6.a) Derive the expression for sequence impedances and draw the sequence impedance diagrams for a $3-\phi$ synchronous generator whose stator winding neutral is solidly grounded.
 b) A 25MVA, 11KV, $3-\phi$ 50Hz generator has its neutral earthed through a 5% reactor. It is in parallel with another identical generator having neutral earthed through a 5% reactor. Each generator has a positive, negative and zero sequence reactances are 25%, 15% and 20% respectively. If a line to ground short circuit occurs in the common bus bar, determine the fault current. [8+8]

7. Using the nominal T method, find the sending end voltage and voltage regulation of a 300KM, 3-phase, 50Hz, transmission line delivering 30MVA, at 0.8 power factor to a balanced load at 132KV. The line conductors are spaced equilaterally 3m apart. The conductor resistance is $0.11 \Omega / Km$ and its effective diameter is 1.5cm. Neglect leakage. [16]
- 8.a) What is string efficiency of an overhead line insulators. Give its significance.
- b) Determine the corona loss for a 3-phase 220KV, 50Hz, 180Km long line, with conductor diameter 1.025Cm, 3m delta spacing, air temperature $26.67^{\circ}C$ and pressure of 73.15cm. [8+8]

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- 4.a) Derive the expression for sequence impedances and draw the sequence impedance diagrams for a 3- ϕ synchronous generator whose stator winding neutral is solidly grounded.
- b) A 25MVA, 11KV, 3- ϕ 50Hz generator has its neutral earthed through a 5% reactor. It is in parallel with another identical generator having neutral earthed through a 5% reactor. Each generator has a positive, negative and zero sequence reactances are 25%, 15% and 20% respectively. If a line to ground short circuit occurs in the common bus bar, determine the fault current. [8+8]
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