Code No: RR310203 **Set No. 1**

III B.Tech I Semester Regular Examinations, November 2006
POWER SYSTEMS-II
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the ABCD parameters of a 3-phase, 80Km, 50Hz transmission line with series impedance of (0.15 + j 0.28) ohms per Km and a shunt admittance of j $5x10^{-4}$ ohm per Km for the both Π and T networks. [16]

2. (a) Give brief description of corona phenomenon. [8+8]
   (b) Derive the expression for potential gradient at the surface of a conductor of 1-phase transmission line.

3. A transmission line conductor at a river crossing is supported from two towers at heights of 45m and 75m above sea level. The span length is 300m. Weight of the conductor 0.85kg/m. Determine the clearance between the conductor and water at a point midway between towers if the tension in the conductor is 2050 kg. [16]

4. (a) Give thelise of various types of UG cables. [4]
   (b) Determine the operating voltage of a single core cable of diameter 2 cm and having three insulating material of permittivites 5, 4, 3. The overall diameter of the cable is 5cm and the maximum working stress is 40kV/cm. Compare the operating voltage with the voltage if the cable were not graded and the material with same working stress was used. [12]

5. (a) Explain how a phase shifting transformer is used simultaneously both for power factor and voltage control . Explain them with neat sketches . [8+8]
   (b) How can an individual consumer of 1-ϕ f and 3-ϕtype would control the power factor at the load side effectively? Explain your answer with respect to different types of consumers .

6. What are the various methods of voltage control in a power system, explain with neat sketches and vector diagrams. [16]

7. (a) What is the importance of base KVA in short circuit calculations? [6+10]
   (b) A generating station has four bus bar sections .Each section is connected to tie bar through 20% reactors rated at 200MVA.Generators of total capacity 100MVA and 20% reactance are connected to each bus bar section. Calculate the MVA fed to a fault under short circuit condition on two of the bus bars.

8. (a) Draw the sequence diagram for single line to ground fault and derive the equation for fault current .Assume that the generator neutral is solidly grounded and generator terminals are open circuited. [8+8]

(b) A 30MVA , 11KV , 3-ϕ synchronous generator has a direct sub transient reactance of 0.25 per unit . The negative and zero sequence reactances are 0.35 and 0.1 per unit respectively .The neutral of the generator is solidly grounded .Determine the sub transient current in the Generator and the line to line voltages for sub transient conditions when a single line to ground fault occurs at the generator terminals with the generator operating unloaded at rated voltage .

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Code No: RR310203 **Set No. 2**

III B.Tech I Semester Regular Examinations, November 2006
POWER SYSTEMS-II
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Input to a single-phase short line is 2000kW at 0.8 lagging power factor. The line has a series impedance of (0.4 + j 0.4) ohms. If the load voltage is 3kV, find the receiving end power factor and supply voltage. [8+8]
   (b) Derive the equivalent ABCD parameters considering nominal T network.

2. A string of suspension insulator consists of four units. The capacitance between each pin and earth is one tenth of the self capacitance of the unit. The voltage between the line conductor and earth is 100kV. Find
   (a) The voltage distribution across the each unit [12]
   (b) the string efficiency. [4]

3. The line conductor of a transmission line has an overall diameter of 19.53mm, weights 0.844 kgf/m, and an ultimate breaking strength of 7950 kgf. If the factor of safety is to be 2 when the conductor has an ice load of 1kgf/m and a horizontal wind pressure of 1:5 kgf/m, find approximately the vertical sag which corresponds to this loading for a 300m span between level supports. [16]

4. (a) Give merits anddemerits of UG scales. [4]
   (b) The test results for 1km of a 3-phase metal sheathed belted cable gave a measured capacitance of 0.7μF between one conductor and the other two conductors bunched together with the earth sheath and 1.2μF measured between the three bunched conductor and the sheath. Find [6+6]
      i. the capacitance between any pair of conductors, the sheath being isolated and
      ii. the charging current when the cable is connected to 11kV, 50Hz supply.

5. (a) Why is their a phase difference between voltage and current in an ac circuit? Explain the concept of power factor? [5]
   (b) Derive an expression for most economical power factor which may be attained by a consumer? [7+5]
   (c) Explain, why a consumer having low power factor is charged at higher rates?

6. (a) When do a transmission system needs a reactor bank for voltage control. What are the different modes of connecting a reactor for voltage control. Explain how would a reactor control the voltage with the help of neat sketches. [8+8]

(b) When do a transmission system needs a capacitor bank for voltage control. What are the different modes of connecting capacitor banks for voltage control. How would a capacitor bank control the voltage, explain with the aid of neat sketches.

7. (a) Explain the harmful effects of short circuit faults on the power system. [6+10]

(b) Two generators are connected to a common bus bar, at which an out going feeder is connected. The generator ratings are 15MVA, 30% and 20MVA, 50% respectively. The percentage reactance of each alternator is based on its own capacity. The bus bar voltage is 12KV. Find the short circuit current that will flow into a complete 3-ϕ short circuit at the beginning of the outgoing feeder.

8. (a) Derive the expression for fault current and the terminal voltages of a 3-ϕ alternator ,when there is a line to line fault occurs at the far end of the alternator. Assume that the generator neutral is solidly earthed. [8+8]

(b) A 3-ϕ , 11KV , 25MVA generator with x0=0.05 p.u.,x1=0.2 p.u. is grounded through a reactance of 0.3Ω . Calculate the fault current for a single line to ground fault. Also calculate the terminal voltage of the faulted phase with respect to ground.

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Code No: RR310203 **Set No. 3**

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POWER SYSTEMS-II
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. Find the ABCD parameters of a 3-phase, 80Km, 50Hz transmission line with series impedance of (0.15 + j 0.28) ohms per Km and a shunt admittance of j $5x10^{-4}$ ohm per Km for the both Π and T networks. [16]

2. (a) List various methods of improving string efficiency. [4]
   (b) In a string of three insulator units the capacitance of each unit is C, from each conductor to ground is C/3, and from each connector to the line conductor is C/5. Calculate the voltage across each unit as a percentage of the voltage. To what value the capacitance between the connector of the unit and the line has to be increased by a guard ring to make the voltage across it equal to that across the next higher unit? [12]

3. An overhead line has the following data: span length 185m, difference in levels of supports 6.5m, conductor dia 1.82cm, weight per unit length of conductor 2.5kg/m, wind pressure $49kg/m^2$ of projected area. Maximum tensile stress of the conductor 4250kg/cm^2. Factor of safety 5. Calculate the allowable sag in meters at the lower support. [16]

4. (a) A single core cable has an inner diameter of 5cms and a core diameter of 1.5cm. Its paper dielectric has a working maximum dielectric stress of 60 kV/cm. Calculate the maximum permissible line voltage when such cables are used on a 3-phase power system. [6]
   (b) A 66kV concentric cable with two inter sheaths has a core diameter 1.8 cm. Dielectric material 3.5 mm thick constitutes the three zones of insulation. Determine the maximum stress in each of the three layers if 20kV is maintained across each of the inner two layers. [10]

5. (a) Why is their a phase difference between voltage and current in an ac circuit? Explain the concept of power factor? [5]
   (b) Derive an expression for most economical power factor which may be attained by a consumer? [7+5]
   (c) Explain, why a consumer having low power factor is charged at higher rates?

6. How does a synchronous generator control the voltage when it is connected in a power system network. Explain it with neat sketch and vector diagrams, and also specify its limitations. [16]

7. (a) What is the importance of base KVA in short circuit calculations? [6+10]

(b) A generating station has four bus bar sections .Each section is connected to tie bar through 20% reactors rated at 200MVA.Generators of total capacity 100MVA and 20% reactance are connected to each bus bar section. Calculate the MVA fed to a fault under short circuit condition on two of the bus bars.

8. (a) What are the different unsymmetrical faults and compare their characteristics

(b) A 3-ϕ , 11KV , 25MVA generator with x0=0.05 p.u.,x1=0.2 p.u. is grounded through a reactance of 0.3Ω .Determine the ratio of fault currents of double line to ground fault to the single line to ground fault considering one fault at a time .

(c) Derive the formulas used in the above problem [6+4+8]

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Code No: RR310203 **Set No. 4**

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POWER SYSTEMS-II
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
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1. (a) Input to a single-phase short line is 2000kW at 0.8 lagging power factor. The line has a series impedance of (0.4 + j 0.4) ohms. If the load voltage is 3kV, find the receiving end power factor and supply voltage. [8+8]
   (b) Derive the equivalent ABCD parameters considering nominal T network.

2. (a) Give brief description of corona phenomenon. [8+8]
   (b) Derive the expression for potential gradient at the surface of a conductor of 1-phase transmission line.

3. The line conductor of a transmission line has an overall diameter of 19.53mm, weights 0.844 kgf/m, and an ultimate breaking strength of 7950 kgf. If the factor of safety is to be 2 when the conductor has an ice load of 1kgf/m and a horizontal wind pressure of 1:5 kgf/m, find approximately the vertical sag which corresponds to this loading for a 300m span between level supports. [16]

4. (a) What do you mean by grading of Cables? Explain briefly different types of grading of cables. [6]
   (b) A conductor of 1 cm diameter passes centrally through a porcelain cylinder of internal diameter 2cms and external diaeter 7cms. The cylinder is surrounded by a tightly fitting metal sheath. The permittivity of porcelain is 5 and the peak voltage gradient in air must not exceed 34kV/cm. Determine the maximum safe working voltage. [10]

5. (a) What are the advantages and disadvantages of static capacitors used for power factor improvement. [8+8]
   (b) Explain the effect of power factor on transmission line conductor size and KVA rating of the equipment.

6. What are the various methods of voltage control in a power system, explain with neat sketches and vector diagrams. [16]

7. (a) What are the different symmetrical faults and compare their properties. [6]
   (b) The section bus bar A and B are linked by a bus-bar reactor rated at 5000KVA with 10% reactance. On bus-bar A there are two generators each of 10000KVA with 10% reactance and on B two generators each of 8000KVA with 12% reactance .Find the steady MVA fed into a dead short circuit between all phases on A and on B with bus-bar reactor in the circuit. [10]

8. (a) Draw the positive , negative and zero sequence networks for the system described as follows. The system consists of a 3-ϕ star connected alternator is supplying power to the 3-ϕ star connected synchronous motor through a delta-star step up transformer , a transmission line and a star- delta step down transformer .The neutral points of the machine windings are solidly grounded and the transformer winding neutrals are un grounded . [10+6]

   (b) Explain the concept of sequence impedances of a 3-ϕ star connected rotating load whose neutral is grounded through some impedance and draw its sequence impedance networks.

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