BITS, Pilani –Dubai Campus
Knowledge Village, Dubai
Year 2003, Semester 2003-2004

Comprehensive Exams

IVth Year- EEE

EEE UC462 – Advanced Power Systems

Max Marks 40 **Time: Three Hours**

Answer any five questions. Each question carries equal marks

Q1 a) What is the importance of load factor? Define two part tariff. (2)

b) The load duration curve for a typical heavy load being served by a combined hydro-steam may be approximated by a straight line, maximum and minimum load being 30,000 and 10,000kW respectively. The hydro power available at the time of minimum regulation flow is just enough to take a peak load of 72000 kwh per day. On investigation it is found economical to pump water from tail pool to a higher level reservoir by utilizing the available power from the steam power station during off-peak period and thus running the station at 100% load factor. Determine the necessary capacities of hydro and steam plant required for the purpose.
Assume efficiency of steam electric conversion as 60%. (6)

Q 2 a) What are the factors to be considered for selection of the site for a thermal power station. Briefly describe the main parts of such type of plant with the help of a neat sketch. (6)

b) A thermal power plant spends Dhs 25 lacks in one year as coal consumption. The coal has heating value of 5000kcal/kg and costs Dhs 500 per ton. If the thermal efficiency is 35% and electric efficiency is 90%, find the average load on the power plant. (2)

Q3 a) A simple power systems is shown in Figure 1 . Redraw this system where the per unit impedances of the components are represented on a common 5000VA base and common system base voltage of 250V (5)

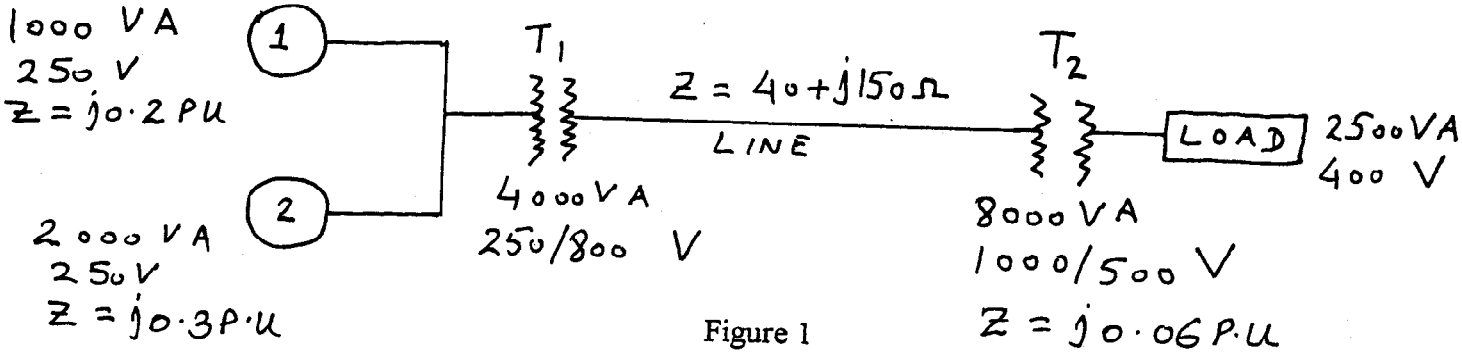

Figure 1

OR

Q3 a) A 3 phase, 11kv, 25 MVA generator with Xo = 0.05 pu, X1= 0.2 p.u and X2=0.2 p.u is grounded through a reactance of 0.3 ohms. Calculate the fault current for a single line to ground fault. (5)

b) If $Er=3<0^\circ$ V, $Er_o=(0.5-j0.866)$ V and $Er_1= 2<0^\circ$ find the negative sequence component of Er and the phase voltages Ey and Eb. (3)

Q4 a) Define skin effect, Re-striking and Recovery voltage (3)

b) A 3 phase, 50 Hz overhead transmission line 100 Km long has the following constants.
Resistance /km/phase=0.1 ohm
Inductive reactance/km/phase= 0.2 Ohm
Capacitive Susceptance/km/phase = 0.04×10^{-4} siemen
Determine sending end voltage and transmission efficiency when supplying a balanced load of 10,000kw at 66kV, p.f 0.8 lagging. Use nominal T method. (5)

Q5 a) A two pole 50 Hz, 11kv turbo alternator has a rating of 100MW, power factor 0.85 lagging. The rotor has a moment of inertia of a 10,000 kg-m2. Calculate H and M. (3)

Q b)Define steady state, dynamic and transient stability. What is swing Equation? Derive its equation. (5)

Q6 a) Discuss Buchholz Relay for the protection of transformer. (3)

b)Draw a diagram of connection of the Merz Pricee circulating current system for protection of a 1000kVA, 11000/400 volts, delta/star 3 phase transformer with the star point connected to ground. Mark on the diagram the turn's ratios of the current transformers for a nominal 5 amp secondary. (5)

Q7 Write Short on any two of the followings
i) Static Relays & Microprocessor Based Relays
ii) Arching and current chopping phenomenon in the Circuit Breakers
iii) Non conventional Energy Sources (4 x 4)

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Test- 1

EEE UC462 – Advanced Power Systems

19th Oct 2003

Max Marks 20

Time: 45 Minutes

Answer all questions

Q1 A region has a maximum demand of 500 MW at a load factor of 50%, the load duration curve can be assumed to be a triangle. The utility has to meet this load by setting up generating systems, which is partly hydro and partly thermal. The costs are as under.

Hydro plant: Dhs 600 per kW per annum and operating expanses at 3 fills per kwh.
Thermal plant: Dhs 300 per kW per annum and operating expanses at 13 fills per kwh.

Determine the capacity of hydro plant, the energy generated annually by each and overall generation cost per Kwh. (10)

Q2 Draw a simple layout of a steam power plant. Explain the functions of its components. Give reasons for low efficiency of steam plants, and discuss their thermal efficiency as well as overall efficiency. (3+4+1+2)

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Test II –Open book

EEE UC462 – Advanced Power Systems

Max Marks 20

Time: 50 Minutes

Answer all questions

Q1 Why is current interruption easier in an a.c. circuit than in a d.c circuit? (3)

Q2 The three resistors of 5, 10 and 20 ohms are connected in delta across the three phases of a balanced 100 volt system. What are the sequence components of currents in the resistor and in the supply lines? (7)

Q3 A three phase generator rated 11 kv, 20MVA has a solidly grounded neutral. Its positive, negative and zero sequence reactances are 60%, 25%, 15% respectively. Calculate the value of reactance that should be connected in generator neutral such that the currents for single line to ground fault does not exceed the rated current. What value of resistance in the neutral will serve the same purpose? (10)