Test-II(Open Book) - Make Up
EEE UC462 – Advanced Power Systems
IVth Year- EEE

Max Marks 20

Time: 50 Minutes

Answer all questions

Q1   Draw   a per unit impedance diagram for the system described below.
Choose a base kVA of 50.Two generators G1 and G2 are in parallel and are
connected to a generator transformer T1 which in turn is connected to a
transmission line L. At the receiving end of the line is connected a transformer T2
, the secondary of which is connected to a motor M.
The equipment ratings are given below:

G1	10kVA.2500V,X=.2 pu
G2	20kVA,2500V,X=.3pu
T1	40kVA,2500/8000V,X=.1pu
T2	80kVA,10000/5000V,X=.09pu
Line	50+j200 ohms
M	25kVA,4000V,X=.1 pu

10 marks

Q2   Explain how would you use an overcurrent characteristic to determine its time
of operation, given the following information:

Relay specification: 1A, 3sec
Plug setting: 125%
Time multiplier setting:.6
Current transformer ratio:400/1
Fault current: 4000A

5marks

Q3 Why is it necessary to provide explosion pot in an OCB?   **5 marks**

Test-I (Closed Book) - Make Up
EEE UC462 – Advanced Power Systems
IVth Year- EEE

Max Marks 20

Time: 50 Minutes

Answer all questions

Q1   List out the main parts of a nuclear reactor and briefly states their function. (4)

Q2   Draw a per unit impedance diagram for the system described below.
Choose a base kVA of 50.Two generators G1 and G2 are in parallel and are
connected to a generator transformer T1 which in turn is connected to a
transmission line L. At the receiving end of the line is connected a transformer
T2, the secondary of which is connected to a motor M.
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G1	10kVA.2500V,X=.2 pu
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Line	50+j200 ohms
M	25kVA,4000V,X=.1 pu

6 marks

Q3 A power system, having a maximum demand of 100 MW, has a load factor of 30% .
It can be supplied by one of the following schemes.

i)   A steam station capable of supplying the whole load.
ii)   A nuclear station capable of supplying the whole load
iii)   A steam station in conjunction with a hydro station, the latter supplying 100 x
10^6 units per annum with a maximum output of 40 MW.

	Steam	Hydro	Nuclear
Capital cost per kW installed capacity	Rs 600	Rs 1500	Rs 2000
Interest and depreciation on capital	12%	10%	10%
Operating cost per unit	5 Paisa	1 Paisa	2 Paisa
Transmission cost per unit	Negligible	0.5 Paisa	Negligible

Work out total cost of the scheme per annum in each case

(10 Marks)

BITS, Pilani –Dubai Campus,
Knowledge Village, Dubai
Year 2005-2006, Semester I

Comprehensive Exams-Make up

IVth Year- EEE

EEE UC462 – Advanced Power Systems

Max Marks 40

Time: Three Hours

Answer all questions.

Q1 a) Compare the annual cost of power supply to a factory having a maximum demand of 500 kW and a load of 40% by having the supply from:

   (iii)   The factory's own diesel generating plant.
   (iv)   A public supply.
   (v)

With regards to (i), the capital cost of factory's own generating plant is Rs 8 lakhs, cost of fuel oil is Rs 200 per ton, fuel consumption o065 lbs per kWh. Capital charges, cost of repairs and maintenance, interest and depreciation 15% of the total capital cost. Salaries and wages of the operating staff are Rs 15,000 per year. With regards to (ii), the tariff is Rs 150 per kW per annum of maximum demand plus 2.5 paisa per kWh. Which of the two alternatives is favorable for the operation of the factory?

(6)

b) Explain how load curve helps in the selection of size and number of generating units

(2)

Q 2 a) What is corona effect? Discuss the advantages and disadvantages of corona.

(3)

b) A 100 MVA 33 kV 3 phase generator has a sub transient reactance of 15%. The generator is connected to the motors through a transmission line and transformer as shown in Figure 1. The motors have rated inputs of 30 MVA, 20 MVA and 50 MVA at 30kV with 20% sub transient reactance. The three phase transformers are rated at 110MVA, 32kV Delta/ 110 kV Star with leakage reactance 8%. The line has a reactance of 50 ohms. Selecting the generator rating as the base quantities in the generator circuit, determine the base quantities in other parts of the system and evaluate the corresponding p.u values.

(5)

Q3 a) Using the nominal pie method, find the sending end voltage and voltage regulation of a 250 km three phase 50 Hz transmission line delivering 25 MVA at 0.8 lagging power factor to a balanced load at 132 kV. The conductor resistance is 0.11 ohm/km, inductance 1.24mh/km and capacitance 0.0094 mH/km. **(4)**

b) Define plug setting multiplier for a relay. Write universal torque equation and explain how the characteristics of different type of relays may be obtained. **(4)**

Q4 a) A star connected 3 phase 10 MVA, 6.6 kV alternator has a per phase reactance of 10% . It is protected by differential protective scheme which is set to operate for fault current not less than 175 A. Calculate the value of earthling resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected. **(4)**

b) Explain the significance of load flow in power system analysis. Classify the various types of busses in power system for load flow studies. Write a nodal admittance matrix for three bus system **(4)**

Q5 Write short notes on any two of the followings. **(4 x 2)**

    i)   Arcing Phenomenon in Circuit Breakers
    ii)   Static and micro processor based relays.
    iii)   Non Conventional Energy Sources

BITS, Pilani –Dubai Campus
Knowledge Village, Dubai
First Semester 2005-2006

IVth Year- EEE/EIE

Comprehensive Exam (Closed Book)

EEE UC462 – Advanced Power Systems

Max Marks 40

Time: Three Hours

Answer all questions

Q1 a) Define the term Diversity factor and prove that the load factor of a system is improved by an increase in diversity of load.
Describe the desirable characteristics of tariff. Derive an expression for depreciation using Sinking fund method.
(1+1+1+1)

b). Compare the annual cost of power supply to a factory having a maximum demand of 500 kW and a load of 40% by having the supply from:
  (i)   The factory's own diesel generating plant.
  (ii)   A public supply.
With regards to (i), the capital cost of factory's own generating plant is Rs 8 lakhs, cost of fuel oil is Rs 200 per ton, fuel consumption 0.3kg per kWh. Capital charges cost of repairs and maintenance, interest and depreciation 15% of the total capital cost. Salaries and wages of the operating staff are Rs 15,000 per year.
With regards to (ii), the tariff is Rs 150 per kW per annum of maximum demand plus 2.5 paisa per kWh. Which of the two alternatives is favorable for the operation of the factory?
4 Marks

Q2 a) Discuss the followings in regard of Unconventional energy sources.
  i) Why do we need to switch to Unconventional Sources?
  ii) Advantages of Unconventional Sources of Energy
  iii) Types of Sources and Estimated Potential
  iv) Tidal Power Generation
  v) Magneto hydrodynamic Generator (MHD)
(1 x 5)

b) What is 'Run off'? How the hydro plants are classified? Discuss briefly.
(1+1=1)

1

Q3 a) What is current chopping? Classify different types of circuit breakers and define arcing voltage, re-striking voltage, recovery voltage and circuit breaker ratings. 4 Marks

b) A 25MVA, 11KV generator has a $X_d^{''}$ = 0.2p.u. Its negative and zero sequence reactances are respectively 0.3 and 0.1p.u. 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 condition when an LG fault occurs at the generator terminals. Assume that before the occurrence of the fault, the generator is operating at no load at rated voltage. Ignore resistances.

4 Marks

Q4 a) A star connected, 3 phase, 10 MVA, 6.6 kV alternator is protected by Merz-Price circulating current principle using 1000/5 amperes current transformers. The star point of the alternator is earthed through a resistance of 7.5 ohm. If the minimum operating current for the relay is 0.5 A. calculate the percentage of each phase of the stator winding which is unprotected against earth faults when the machine is operating at normal voltage. 4 Marks

b) Discuss protection of HV and EHV lines by Distance relaying. Also describe phase comparison pilot relaying scheme. 4 Marks

Q5 a) 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 suceptance /km/ phase = 0.04 x 10^{-4} siemens
  i) Determine the sending end voltage and ii) transmission efficiency when supplying a balanced load of 10,000 kw at 66 kV, p.f 0.8 lagging. Use nominal T method. 4 marks

b) Draw an Impedance diagram for the system shown in figure 1, expressing all values as per unit values. 4 Marks
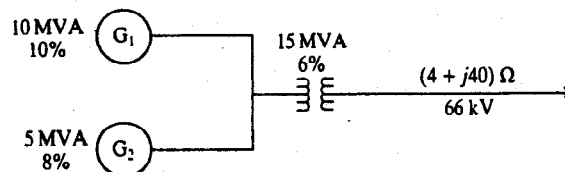

Figure 1

**BITS, Pilani –Dubai Campus,
Knowledge Village, Dubai
First Semester 2005-2006**

Test-II (Open Book)

**EEE UC462 – Advanced Power Systems
IVth Year- EEE**

Max Marks 20

Time: 50 Minutes

Answer all questions

Q1 A balanced load of 50 MW at .8 power factor lagging is supplied at 132 kV, 50 Hz by means of a transmission line. The series impedance of a single conductor is (20+ j 50) ohms, and the total phase-neutral admittance is 300 micro siemens. Using the nominal T approximation, calculate the sending end voltage. If the load is removed and the sending end voltage remains constant find the percentage rise in voltage at the receiving end.

8 Marks

Q2 A single phase resistive load of 100 kVA is connected across lines bc of a balanced supply of 3 kV. Calculate the symmetrical components of the line currents. **3 Marks**

Q3 Why an over current relay is used only up to 50 kV line. **2 Marks**

Q4 What is the purpose of line trap and line tuner in carrier current protection scheme of transmission line?

3 Marks

Q5 A three phase, delta – star connected, 15 MVA, 33/11-kV transformer is protected by CTs. Determine the CT ratios for differential protection such that the circulating current through the transformer delta does not exceed 5A.

4 Marks

Name of Student

ID No

BITS, Pilani –Dubai Campus
Knowledge Village, Dubai
Year 2005-2006, Semester I

Quiz-   IVth   Year- EEE

Quiz Test

EEE UC462 – Advanced Power Systems

Max Marks 10

Time: 15 Minutes

Date 08/11/2005

Answer all questions. Each question carries equal marks

Q1 In transmission line calculations, Shunt capacitance is neglected in

a) Long line
b) Medium Line
c) Short line
d) Irrespective of length

Q2   Corona loss can be reduced by the use of hollow conductors, because

a) the current density is reduced
a) the eddy current in the conductor is eliminated
b) for a given cross section the radius of the conductor is increased
c) of better ventilation in the conductor

Q3 In Boiling Water Reactor fuel used is ....

Q4 To increase the electrical conductivity in M H D a seeding material such as .... is used.

Q5 The theoretical power in a wind system is given by

$$P = 0.5 \, q \, A \, V^3 \quad Watt$$

Where q is density of air

What represent A and V.

Q6 As the frequency increases the skin effect

a) Increases   b) Decreases   c)   Remains the same

Q7 Where Economizer is installed in Thermal Power Plant

Q8 In a balanced 3 phase system, negative and zero sequence currents are ....

Q9 Why transposition of conductors is done in case of three phase transmission lines.

Q10 The bundling of conductor is done to

a) reduce reactance

b) increase reactance

c) increase radio interference

d)) reduce reactance and radio interference

BITS, Pilani –Dubai Campus,
Knowledge Village, Dubai
First Semester 2005-2006

Test-I (Closed Book)

EEE UC462 – Advanced Power Systems
IVth Year- EEE

Max Marks 20

Time: 50 Minutes

Answer all questions

Q 1 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: Rs 600 per kW per annum and operating expanses at 3 paise per kWh.
Thermal Plant: Rs 300 per kW per annum and operating expanses at 13 paise per kWh.
Determine the capacity of hydro plant, the energy generated annually by each and overall generation cost per kWh.

(8 Marks)

Q2 What is the function of Economizer in thermal power and why surge tank is used in Hydro station.

(1+1) Marks

Q3 Write in brief how nuclear waste is disposed off in nuclear power station.

(2 Marks)

Q4 Draw   a per unit impedance diagram for the system described below.

Choose a base kVA of 50
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Line = 50+j200 ohms
M = 25kVA,4000V,X=0.1 pu

(8 Marks)