UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, April 2018

Program: B Tech Electrical Engg	**Semester – VIII**
Subject (Course): Power System Automation & Smart Grid	**Max. Marks : 100**
Course Code : ELEG 475	**Duration : 3 Hrs**
No. of page/s:02	

SECTION-A

30 Marks

(Attempt all questions)

1	Design a Ladder logic for switching ON /OFF the lamp using two switches. The design should be simple and can be controlled by each switch.	**[8]**	**CO2**
2	a) Explain the Open wire communication technique with neat sketch b) If a PLC (Power Line Communication), equipment uses a carrier frequency 500 kHz. If the value of inductance in the line trap is 0.35 mH, calculate the value of capacitance required.	**[8]**	**CO3**
3	A specification sheet of a smart meter states that its rated current is 75 A and power dissipation is 4.5 W. it employs a current sensing resistor of 275 micro ohms. When the load current is at the rated value of the meter, calculate a) Power dissipation in all other components of the meter b) Voltage across the current sensing resistor at full load current	**[7]**	**CO3**
4	Explain the Basic Block Diagram of PLC and Explain the Ladder Diagram of OR Function.	**[7]**	**CO2**

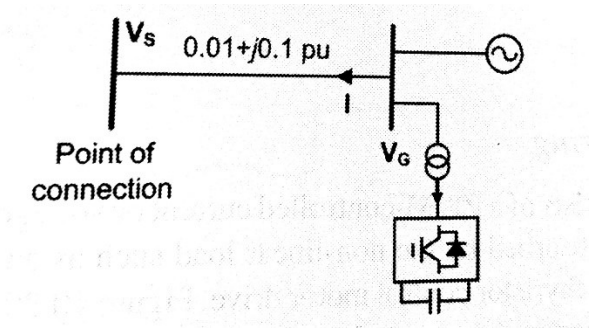
SECTION-B

45 Marks

(Attempt all questions)

5	Explain Direct on line (DOL) starting of induction motor. Draw ladder diagram for DOL starter using PLC.	**[15]**	**CO3**
6	a) Describe Optical Fiber communication for the Power system automation. b) A step index multimode fiber has a core of refractive index 1.7 and cladding of refractive index 1.535. Calculate the maximum allowable angle of acceptance for refraction on core-cladding surface.	**[15]**	**CO4**

7 [15] CO3

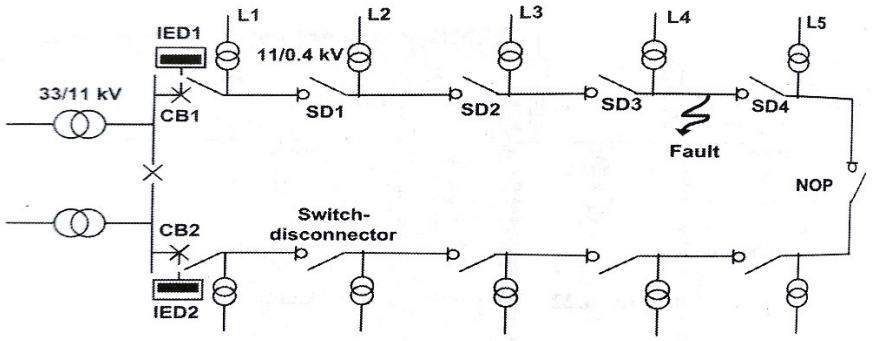


A 5 MW induction generator of a hydro scheme is connected to the distribution system as shown in above fig. when the induction generator generates 5 MW, it absorbs 2.5 Mvar of reactive power.
When the reactive power generation of the D-STATCOM is Q_c, it was found that the voltage at the point of connection is $1.00132.9^0\angle$ pu and the terminal of the generator is $10^0\angle$ pu. Calculate the value of Q_c. The per unit values are given on 10 MVA basis.

SECTION-C

25 Marks **CO4**

8



The figure represents a typical 11 kV distribution network section. IED1 & IED2 consists an over current protection element. The fault occurred in between SD3 and SD4. Restore the supply in less span time is the main objective. Considering the data given,

a) Propose a simple method to reduce the restoration time of loads L1, L2, L3 and L4.

b) Propose a fully automated distribution network

c) Propose an automatic restoration method in steps.

Roll No: ----------

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SECTION-A

30 Marks

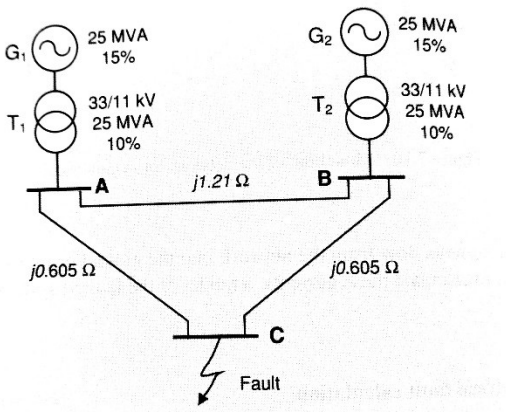
(Attempt all questions)

1	Explain the Optical Ground Wires (OPGW) with advantages and limitations by comparing with other communication networks.	**[8]**	**CO2**
2	Explain the Basic Block Diagram of PLC and Explain the Ladder Diagram of AND Function.	**[7]**	**CO2**
3	Explain the following a) Master bridge with neat sketch b) Slave bridge with neat sketch	**[8]**	**CO2**
4	A smart meter states that its rated current is 100 A and power dissipation is 3 W. it employs a current sensing resistor of 300 micro ohms. When the load current is at the rated value of the meter, calculate the gain of the PGA to match with an ADC having a full scale of 7.5V.	**[7]**	**CO3**

SECTION-B

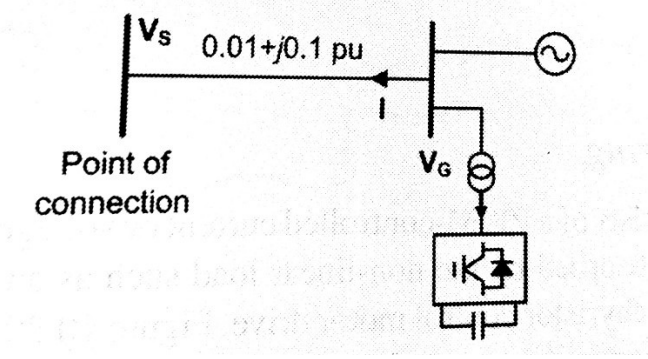
45 Marks

(Attempt all questions)

5	Explain Star Delta starting of induction motor. Draw ladder diagram for Star- Delta starting using PLC.	**[15]**	**CO3**
6	 For the power system shown in above fig, draw the network diagram giving all reactances on 100 MVA base. Calculate the fault current in pu and in amperes for a three phase short circuit fault at C. all pre	**[15]**	**CO4**

fault voltages are 1.0 p.u. ignore any effect of system loads.

7 **[15]** **CO3**



Derive the expression for the voltage at the point of connection V_S in terms of active power generated P, net reactive power absorbed Q and generator terminal voltage V_C.

SECTION-C

25 Marks **CO4**

8

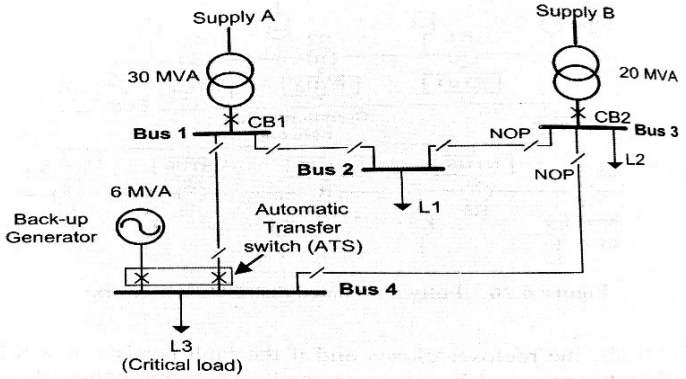


Fig (a)

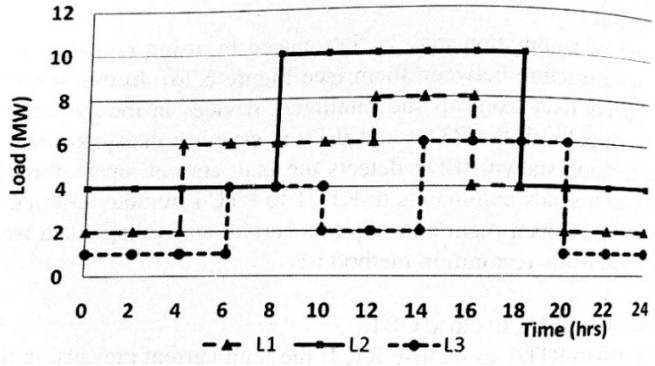


Fig (b)

A section of distribution network is shown in the above fig (a). Daily load profiles of each load are given fig (b). all loads are assumed to be unity power factor:

a) Discuss the consequence of loss of Supply A when the automation is absent
b) Discuss a possible automatic restoration scheme which employs an Agent and re-closers with remote terminal units that provide minimum interruption to all the loads