Mansoura University Faculty of Engineering Dept. of Electrical Eng. 4th year Electrical Engineering Students Selective course (2): EE2414 [Applications of Artificial Intelligence]		First Semester 2011/2012 Time : 3 hours Full Mark : 70 Marks

First Semester Final Exam (*1-1-2012*)

Answer ALL of the following questions (In TWO pages)

1- (a) Define and mention the different categories of Computational Intelligence.
(b) Define fuzzy systems and mention the fuzzy sets operators.
(c) Explain in detail the operation of a fuzzy logic controller.
(d) Define and mention the methodologies of Evolutionary computing.
(e) Define and state the steps of the Genetic Algorithms.

[15] Mark

2- (a) Define Artificial Neural Networks (ANN) and draw a diagram that explains the feed-forward neural network operation.
(b) Show how the ANN is developed based on the human neuron construction and operation.
(c) Compare supervised and unsupervised ANN training methods, using definitions, Flow charts, and Power system examples.
(d) Explain in details the major components of an (ANN).
(e) State both Hebb's leaning rule, and explain numerically this rule considering a two neuron network with a learning rate equal 1 and without hidden layers.

[15] Mark

3- (a) State the idea and the objective of the delta learning rule?
(b) Derive the algebraic expression of the delta rule for single and several outputs.
(c) State the weights' update using the generalized delta rule.

[10] Mark

4- (a) Differentiate crisp and fuzzy logic, and mention a few examples of crisp and fuzzy sets.
(b) Define universe of discourse.
(c)What is a membership function? State the different types of membership functions.

See PAGE 2

(d) Define Singleton and Linguistic variables.
(e) Define term set with an example.

[10] Mark

5- Write MATLAB codes for the presentation and plot of the following:
(a) Gaussian membership function.
(b) Exponential membership function.

[10] Mark

6- For a Power Electronics FACTS device used to improve the power system stability shown in Fig.1:

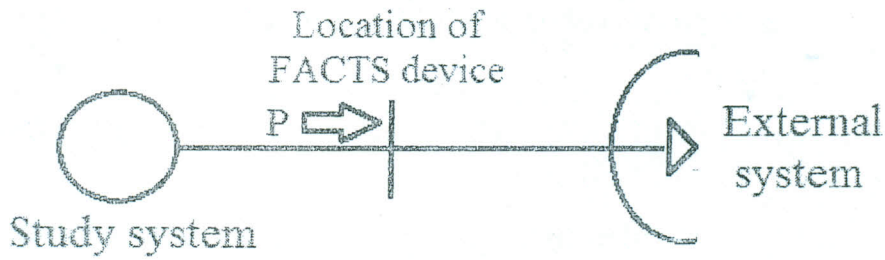

Fig.1

(a) Explain the principle of stability control based on the real power measurement, and show the basic configuration of a proposed FUZZY LOGIC switching controller.
(b) Explain mathematically in detail using two membership functions, the weighted averaging defuzzification algorithm used to generate the switching signals for the FACTS device.

[10] Mark

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Mansoura University
Faculty of Engineering
Electrical Engineering Dept.

B.Sc. of Electrical Engineering
Three Hours Time allowed
Selected Course 2
(Transients in Power Systems)
Sunday 01/01/2012
Total Score 70 Marks

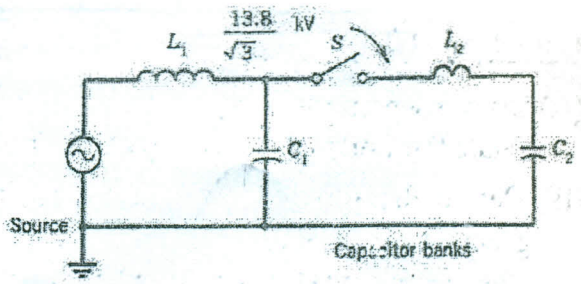
Answer the Following Two Questions

Question # 1 (38 Marks):

(A) Define the following: (6 Marks)

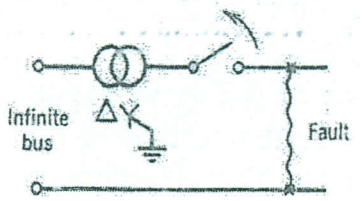
i- Reignition in CB
ii- RRRV

(B) The figure shows two capacitor banks, C_1 and C_2, in a substation. C_1 is energized, but C_2 is discharged. The three-phase, 50 Hz ratings of the banks are: C_1, 15 MVA; C_2, 10 MVA, on a 13.8 kV base. The source has a short circuit rating of 50 kA rms at 13.8 kV. The Inductance of the loop between C_1 and C_2, represented by L_2 is 50 μH. Calculate the peak transient voltage that will appear on C_2 and the peak transient current that will flow in L_1, if the switch S is closed at the peak of the voltage cycle. Point out any assumptions you make. (12 Marks)



(C) A line to ground fault occurs as indicated in Figure close to the secondary terminals of a 230/34.5 kV transformer. The transformer has a three-phase rating of 200 MVA; it has 0.1 pu reactance on this base Calculate:

i. The fault current
ii. The time to peak of the transient recovery voltage when the circuit breaker opens to interrupt the fault current. A value of 15.0 nF can be assumed for the effective capacitance per phase of the transformer secondary winding. (10 Marks)



(D) Discuss in details how you can calculate the voltage at connection point between a line and a cable using the Bewley Lattice Diagram. (10 Marks)

Mansoura University
Faculty of Engineering
Electrical Engineering Dept.

B.Sc. of Electrical Engineering
Three Hours Time allowed
Cutting & Protection Instruments
Sunday 1/01/2012
Part II

Answer the Following Questions

Please Answer This Part from the Left Side of Your Answer Paper

Question # 1 (15 Marks):

(A) Discuss the operating characteristic of a Mho-type distance relay. (4 Marks)

(B) Derive the current-time relation for the plunger type electromagnetic relay using the first principles. (6 Marks)

(C) Draw a possible circuit configuration for a solid-state over-current relay. Sketch the waveforms at each node in the proposed circuit. (5 Marks)

Question # 2 (20 Marks):

(A) Draw a schematic diagram to represent a phase comparison carrier-current-pilot equipment and state the function of each part of the diagram. (5 Marks)

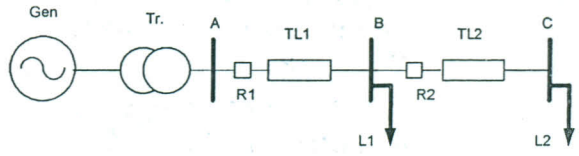
(B) Derive the torque equation of an induction type two input signals relay, if one flux is generated by $v = 110 \sin(\omega t)$ through N_v turns which has an impedance of 2+j60 ohms. The other relay signal is generated by a current $i = 100 \sin(\omega t+30)$ through N_i turns. (6 Marks)

(C) Explain the basic operation principles of the two-element current-balance relay. Use a schematic diagram as you can. (4 Marks)

(D) Explain using sketch diagrams the basic principles of differential protection. (5 Marks)

Question # 3 (20 Marks):

(A) Consider the power system shown in Fig. The important data are given as follows: Generator (Gen) : 1000 MVA, 20 kV, X_s=100%, X''_d=X_1= 10%, L1: 200 MW, 20 kV, 0.8 lag PF , L2 : 150 MW, 20 kV, 0.9 lag PF. TL1 : X_1=15%, - TL2 : X_1=10%, on base of 1500 MVA, 500kV. Transformer (Tr): 1000 MVA, 500Y/20D kV, X=17% . Assume the relay R1 is set to pickup for a three-phase fault at bus C. If the pickup setting is equal to one-third of the fault current, what is the pickup setting of this relay? (8 Marks)



(B) Compare using sketch diagrams between the opposed-voltage and circulating-current principles of ac wire-pilot relaying. (8 Marks)

(C) There is many properties must be considered for power system protection. State three important items and define each of them. (4 Marks)

With My Best Wishes

Dr. Ebrahim A. Badran

UNIVERSITY OF EL-MANSOURA
FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL POWER AND MACHINE ENGINEERING

Bs.c Term EXAMINATION — January 2012
SUPJECT: Switchgear and Protection Devices — TIME:1.5 Hours

Part (1) Switchgear

Question # 1 (25 Marks):

Discuss briefly the following:

a- Current limiting feature of the air break circuit breaker.
b- Multiple reignition phenomena in Vacuum circuit breaker.
c- The arc extinction techniques.
d- The merits and demerits of the Air Blast Circuit Breaker.
e- Substation bus configurations.

Question # 2 (30 Marks):

a) Prove that the critical damping switching resistance is equal to = $\frac{1}{2}\sqrt{\frac{L}{C}}$

b) In a short circuit test on a 3 poles 132 KV circuit breaker, the power factor was 0.2, the recovery voltage was 0.95 times the peak value. The frequency oscillations of restriking voltage were 26 KHz. Assume a symmetrical breaking current, and estimate the rate of restriking voltage for the following cases;

i- The neutral is grounded and the fault involves ground;
ii- The neutral is grounded and the fault does not involve ground;

c) With the help of neat sketches Describe arc quenching process in Thermal Blast Chamber type SF_6 circuit-breaker.

With My Best Wishes
Prof. Gabr Abdel-Salam