Question number (2) **(40 Marks)**

a) **Describe** the effect on the torque-speed characteristics of an induction motor produced by:

(i) Halving the applied voltage
(ii) Halving the applied voltage and frequency, *then answer the following:*

1. **Sketch** the resultant torque-speed curves relative to that of rated voltage and rated frequency. **Neglect** the effect of the stator resistance and leakage reactance
2. **Explain** what happens if the effect of the stator resistance and leakage reactance is included.
3. **Explain why** it is necessary to reduce the voltage applied to an induction motor as the electrical frequency is reduced. **(15 Marks)**

b) A three-phase, 200 hp, 440-V, 50 Hz, 4-poles wound-rotor induction motor controls a speed of a fan. The torque required for the fan varies as the square of the speed. At full-load (200 hp) the motor slip is 0.03 with the slip ring short circuited. The slip-torque relationship of the motor can be assumed to be linear from no load to full load. The resistance of each rotor phase is 0.02 ohms. **Determine** the value of the resistance to be added to each rotor phase so that the fan runs at 1320 rpm, *then answer the following:*

1. **Sketch** the slip-torque curve relative to that of rated conditions. **Indicate** the operating point for each case.
2. **Explain** what happens to the rotor induced voltage, the rotor current, the rotor copper losses, the developed torque, the output power and the overall efficiency. **(15 Marks)**

c) **Give short notes** on the main features of the following:

(i) Deep-bar and a double-cage squirrel-cage rotor
(ii) Crawling and cogging
(iii) Starting code letters **(10 Marks)**

Question number (3) **(30 Marks)**

a) A 25 HP, 440-V, 5o Hz, 8-pole, 3-phase star connected induction motor has a diameter of 0.3 m and the length of the core is 0.12 m. the number of stator slots is 72 with 20 conductors per slot. *Assume the winding factor = 0.955 and the full load efficiency of 86 % and the power factor of 0.84.*

(i) **Discuss briefly** the factors affect the choice of specific magnetic loading and specific electric loading of the three-phase induction machine.
(ii) **Find** the specific magnetic loading and the specific electric loading of the machine.
(iii) **Calculate** the magnetizing current per phase if the length of the air gap is 0.5 mm. Assume the *MMF* required for the iron parts to be 30 percent of the air gap *MMF*.
(iv) *Use the data for this machine* (ℓ/τ_p , C_o , η , pf , k_w); **determine** the main dimensions of a 15 HP, 440 V, 6-pole, 50 Hz induction motor. **(22 Marks)**

b) **Derive** an expression for the rotor winding resistance of a 3-phase squirrel-cage induction motor referred to the stator side. **(8 Marks)**

WISH YOU ALL THE BEST

Dr. Said M. Allam

Course Title: Electrical Machines (3)	Course Code: EPM3215	Year: 3rd
Date: June 25th 2011 (Second term)	Allowed time: 3 hrs	No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches if possible)

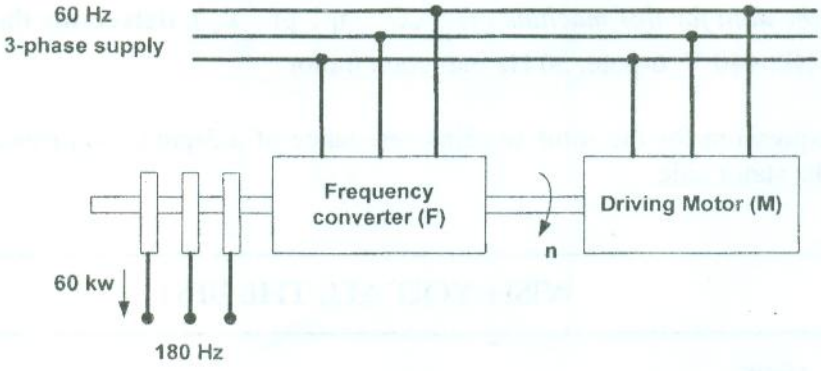
Question number (1) **(50 Marks)**

a) A three-phase, 230-V, 50-Hz, 940 rpm, 6-pole, delta-connected squirrel-cage induction motor has the following equivalent circuit parameters: $R_1 = 0.25\ \Omega$, $X_1 = X_2 = 0.8\ \Omega$, $R_c = 105\ \Omega$, $X_m = 45\ \Omega$. The motor develops the maximum torque at a speed of 820 rpm. The friction loss is 4% of the developed power. **Answer the following:**

(i) **Determine** the referred rotor resistance.
(ii) **Determine** the rated line current and power factor.
(iii) **Determine** the rated air-gap power.
(iv) **Determine** the rated developed power and developed torque.
(v) **Determine** the rated shaft horsepower and shaft torque.
(vi) **Determine** the motor efficiency at rated conditions.
(vii) **Determine** the starting torque, the breakdown torque and the corresponding power.
(viii) **If** the starting current in the line is limited to full-load current by means of an auto-transformer starter, **what** will be the starting torque as a percentage of full-load torque?
(ix) **If** a star/delta starter is used, **determine** the starting torque and the starting current.
(x) **What** would be the approximate reading of the measuring instruments (Voltmeter, Ammeter and Wattmeter) when the machine is connected for both no-load and blocked-rotor test conditions? **(32 Marks)**

b) It is required to use a 30 kW, 860 rpm, 60 Hz wound rotor induction motor as a frequency converter (F) to generate 60 kW at an approximate frequency of 180 Hz as shown in the figure. **if** the supply frequency is 60 Hz and all losses are neglected, **Answer the following:**

(i) **Determine** the speed of the induction motor (M) that driving the frequency converter (F).
(ii) **Determine** the active power delivered to the stator of the frequency converter.
(iii) **Determine** The mechanical power of the induction motor (M).
(iv) **Will** the frequency converter overheat under these conditions? **Name** this mode?
(v) **Determine** the speed of the stator field with respect to the stator structure, the revolving rotor structure and the rotor field.
(vi) **Determine** the speed of the rotor field with respect to the rotor structure, the stator structure, and the stator field. **(18 Marks)**



(iii) The eigenvalues of the resulting discrete-time model of part (i)

(b) Using the Jury test tabulation, check the stability of the system that have the following characteristic equation [6 Marks]

$$P(z) = z^4 - 0.1z^3 + 0.2z^2 - 0.5z - 0.3$$

Problem number (4) **(15 Marks)**

(a) Explain the main methods that are available for tuning PID controllers. [4 Marks]

(b) Given an open-loop control state-space model, [6 Marks]

$$\dot{x} = \begin{bmatrix} 1 & 1 \\ 0 & -4 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

Design a state-feedback controller using

- Direct comparison method
- Ackermann's formula

such that the closed-loop system poles have the values

$$s = -2, \; s = -2$$

(c) Determine the stable range of the parameter k for the closed-loop unity feedback system with open-loop gain [5 Marks]

$$G(z) = \frac{1.1(z-1)}{(z-k)(z-0.8)}$$

Problem number (5) **(15 Marks)**

A regulator contains a plant that is described by

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ -1 & -2 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

$$y = \begin{bmatrix} 1 & 0 \end{bmatrix} x$$

and has a performance index

$$J = \int_0^\infty \left[x^T \begin{bmatrix} 2 & 0 \\ 0 & 1 \end{bmatrix} x + u^2 \right] dt$$

Determine

(i) The Riccati matrix P [7 Marks]

(ii) The optimal state feedback matrix k_{opt} [5 Marks]

(iii) The closed-loop eigenvalues [3 Marks]

Z-transform

$\delta(n)$	1
$u(n)$	$\frac{z}{z-1}$
$a^n u(n)$	$\frac{z}{z-a}$
sin (an)	$\frac{z \sin(a)}{z^2 - 2z\cos(a) + 1}$
cos (an)	$\frac{z[z - \cos(a)]}{z^2 - 2z\cos(a) + 1}$

Laplace transform

$\delta(t)$	1
$u(t)$	$\frac{1}{s}$
e^{-at}	$\frac{1}{s + a}$

GOOD LUCK

Dr. Ali Abu Tahoun

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 75 Marks

Faculty of Engineering

Course Title: Control of Electrical Power Systems (1) | Course Code: EPM3216 | 3rd year
Date: June 11th 2011 (Second Term) | Allowed Time: 3 hrs | No. of Pages: (2)

Remarks: (Answer the following questions... Assume any missing data)

Problem number (1) **(15 Marks)**

(a) Define the following terms [6 Marks]

- Controllability
- Observability
- Zero order hold (ZOH)
- Eigenvalues
- Robust Control
- Open and closed loop control systems

(b) Find z-transform for the following sequences [4 Marks]

(i) $x_1(n) = nu(n)$ (ii) $x_2(n) = (-1)^n e^{-2n}$

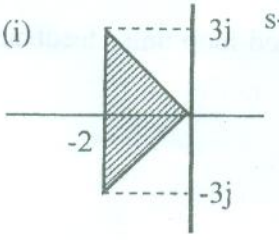
(c) Find the inverse z-transform of [5 Marks]

(i) $X_1(z) = \dfrac{10}{(z-0.5)(z^2+3z+1)}$ (ii) $X_2(z) = \dfrac{z}{z^2+4}$

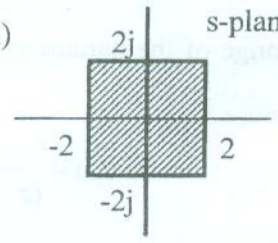
Problem number (2) **(15 Marks)**

(a) Explain the relationship between s-plane and z-plane showing the sable and unstable regions in each one, then find the mapping of the following s-plane regions to the z-plane. [5 Marks]

(i)



(ii)

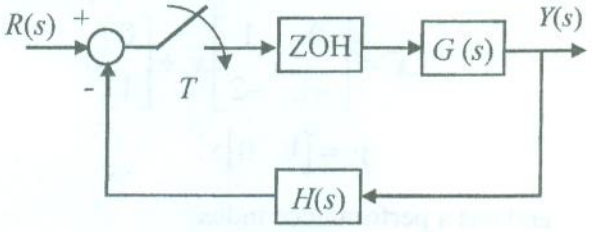


(b) For the following block diagram, if [10 Marks]

$G(s) = \dfrac{1}{s+1}$, $H(s) = \dfrac{1}{s+2}$,

$T = 0.1$ sec

- Find $Y(z)/R(z)$



Problem number (3) **(15 Marks)**

(a) For the following continuous-time model [9 Marks]

$$\dot{x}(t) = \begin{bmatrix} 0 & 1 \\ 0 & -3 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

$$y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} x(t)$$

Find

(i) The corresponding discrete-time model, $T = 1$ sec.

(ii) The characteristic equation of the resulting discrete-time model of part (i)

b) **Mention the firing circuit requirents . (6 Marks)**

Problem number (4) (15 Marks)

a) **A 3-ϕ bridge inverter is supplied from a 900V dc source & supply an inductive load star connected of (R=20 Ω ,L =37mH, f_o=50Hz) per phase. Using 180° conduction control to fined**

(i) the useful power

(ii) the rating of the switch (iii) supply current (10 Marks)

b) **What are the trigger circuit components ?**

(5 Marks)

Good Luck

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 60 Marks

Faculty of Engineering

Course Title: Power electronics (2) | Course Code: EPM3213 | Year: 3rd
Date: June 14th 2011 (second term) | Allowed time: 3 hrs | No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches…etc)

Problem number (1) (15 Marks)

A three phase ac voltage controller supplies a wye-connected resistive load of R=25Ω. The supply voltage is 380V at 50Hz. Sketch the phase o/p voltage (v_a) & v_{T1} for the delay angle 120° then determine :

(a)the rms o/p phase voltage v_o

(b)input power factor

(c) $I_{sw\ rms}$ &$I_{sw\ peak}$

(d) the rating of SCR .

Problem number (2) (15 Marks)

A 1-ϕ transformer tapchanger is controlled as a synchronous tapchanger , the primary voltage is 220 V , 50 Hz . The secondary voltages are V_1 =220 V & V_2=140 V . If the delay angle of T_1 is 45° , and the load resistance is 10Ω determine :

(a) The rms load voltage.

(b)The rms current of T_1.

(c) The rms current of T_3 .

(d) The input power factor .

Problem number (3) (15 Marks)

a) **Design a chopper circuit to feed a load with dc voltage of 25 V.(with maximum variation of 20 mV) and dc current of 0.5 A ripple free from dc supply 6 V and the maximum value of supply current is 1.43 A, using chopper frequency 20 KHz .Then determine $I_{sw\ av}$ &$I_{sw\ peak}$.** **(9 Marks)**

P. T. O

m) In the PIC16F84, The program memory is 14bits but the data memory is 13bits,

n) The software interrupts cannot be masked and they cannot be disabled,

o) The INTR is a non-vectored interrupt and the TRAP, RST 7.5, RST 6.5 and RST 5.5 are vectored interrupts,

p) In the PIC16F84, The Program Counter (PC) is 14-bits wide,

q) The EEDATA register contains the data to be written to EEPROM memory.

2- Write an 8085 program for exchanging the contents of memory locations 4000H and 8000H.

3- Write a program for displaying binary up counter. Counter should count numbers from 00H to FFH and it should increment after every 0.5 sec. Assume operating frequency of 8085 equal to 2MHz. (Assume that the Display routine is available).

4- What are the sources of interrupt in PIC16F84A?

5- For the PIC16F84, write a program for initializing PORT B?

6- State eight microcontroller features?

مرفق جدول الأوامر الخاصة بالمعالج ٨٠٨٥

Dr. Galal Atlam

Mnemonic	Op	SZAPC	~s	Description	Notes
ACI n	CE	*****	7	Add with Carry Immediate	A=A+n+CY
ADC r	8F	*****	4	Add with Carry	A=A+r+CY (21X)
ADC M	8E	*****	7	Add with Carry to Memory	A=A+[HL]+CY
ADD r	87	*****	4	Add	A=A+r (20X)
ADD M	86	*****	7	Add to Memory	A=A+[HL]
ADI n	C6	*****	7	Add Immediate	A=A+n
ANA r	A7	****0	4	AND Accumulator	A=A&r (24X)
ANA M	A6	****0	7	AND Accumulator and Memory	A=A&[HL]
ANI n	E6	**0*0	7	AND Immediate	A=A&n
CALL a	CD	-----	18	Call unconditional	-[SP]=PC, PC=a
CMP r	BF	*****	4	Compare	A-r (27X)
CMP M	BF	*****	7	Compare with Memory	A-[HL]
CPI n	FE	*****	7	Compare Immediate	A-n
DAA	27	*****	4	Decimal Adjust Accumulator	A=BCD format
DAD B	09	----*	10	Double Add BC to HL	HL=HL+BC
DCR r	3D	****-	4	Decrement	r=r-1 (0X5)
DCR M	35	****-	10	Decrement Memory	[HL]=[HL]-1
DCX B	0B	-----	6	Decrement BC	BC=BC-1
DI	F3	-----	4	Disable Interrupts	
EI	FB	-----	4	Enable Interrupts	
HLT	76	-----	5	Halt	
IN p	DB	-----	10	Input	A=[p]
INR r	3C	****-	4	Increment	r=r+1 (0X4)
INR M	3C	****-	10	Increment Memory	[HL]=[HL]+1
INX B	03	-----	6	Increment BC	BC=BC+1
JMP a	C3	-----	7	Jump unconditional	PC=a
LDA a	3A	-----	13	Load Accumulator direct	A=[a]
LDAX B	0A	-----	7	Load Accumulator indirect	A=[BC]
LHLD a	2A	-----	16	Load HL Direct	HL=[a]
LXI B,nn	01	-----	10	Load Immediate BC	BC=nn
LXI D,nn	11	-----	10	Load Immediate DE	DE=nn
MOV r1,r2	7F	-----	4	Move register to register	r1=r2 (1XX)
MOV M,r	77	-----	7	Move register to Memory	[HL]=r (16X)
MOV r,M	7E	-----	7	Move Memory to register	r=[HL] (1X6)
MVI r,n	3E	-----	7	Move Immediate	r=n (0X6)
MVI M,n	36	-----	10	Move Immediate to Memory	[HL]=n
NOP	00	-----	4	No Operation	
ORA r	B7	**0*0	4	Inclusive OR Accumulator	A=Avr (26X)
ORA M	B6	**0*0	7	Inclusive OR Accumulator	A=Av[HL]
ORI n	F6	**0*0	7	Inclusive OR Immediate	A=Avn
OUT p	D3	-----	10	Output	[p]=A
POP B	C1	-----	10	Pop BC	BC=[SP]+
PUSH B	C5	-----	12	Push BC	-[SP]=BC
SUB r	97	*****	4	Subtract	A=A-r (22X)
SUB M	96	*****	7	Subtract Memory	A=A-[HL]
SUI n	D6	*****	7	Subtract Immediate	A=A-n
STA a	32	-----	13	Store Accumulator	[a]=A
STAX B	02	-----	7	Store Accumulator indirect	[BC]=A

Tanta University
Faculty of Engineering
Electrical Power Eng. Dept.
Time: 3 Hours

2nd term Exam.
3rd Year. 21/06/2011
microprocessor applications

Answer All Questions:

1- Put √ for true and × for false:

a) MIPS is a rough measure of the performance of a CPU,

b) RST 5.5, RST 6.5 and RST 7.5 are Hardware interrupts,

c) The size of the address bus determines the size of memory,

d) The data bus synchronizes all the microprocessor operations with the clock and generates the control signals necessary for communication between the microprocessor and peripherals,

e) AC flag bit is set to a "1" by the instruction just ending if a carry occurred from bit 3 to bit 4 of the A Register during the instruction's execution,

f) The instruction MOV M, A means, the memory data addressed by H L pair is moved to A register,

g) One T-state is the time period of one clock cycle of the microprocessor,

h) Instruction Cycle is the time required to execute an instruction and the Machine Cycle is the time required to access the memory or input/output devices,

i) In vectored interrupts, the manufacturer fixes the address of the ISR to which the program control is to be transferred but in non-vectored interrupts the interrupted device should give the address of the ISR,

j) When an interrupt is masked the processor will not accept the interrupt signal,

k) In I/O Interfacing the Interrupt Driven I/O method is better than Programmed I/O method because of Processor can be doing other tasks while waiting for the data transfer be completed,

l) The PIC 16F84 is a CISC CPU,

P.T.O.

b) Compare between Newton-Raphson and Gauss-Seidel Methods. (10 Marks)

Problem number (3) **(50 Marks)**

a) The system data of electrical power system shown in Fig. (3) is given below. If the motor loaded by 9MW, 10.5 kV and 0.6 lagging power factor, find the line currents and phase and line voltages for solidly line-to-ground fault at mid-point of $T.L_2$, F.

(20 Marks)

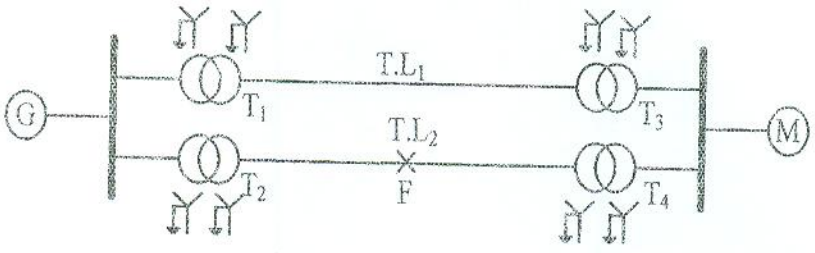


Fig. (3)

Generator	10 MVA, 11 kV, x1=0.14 p.u., x2=0.15 p.u., x0=0.04, xn=0.1 p.u.
Motor	10 MVA, 11 kV, x1=0.18, x2=0.20 p.u., x0=0.075 p.u., xn=0.15 p.u.
T1, T2	5 MVA, 11/66 kV, x=0.1 p.u.
T3, T4	5 MVA, 66/11 kV, x=0.12 p.u.
T.L1, T.L2	5 MVA, x1=x2=0.15 p.u. , x0=0.45 p.u.

b) A simultaneous fault occurred at generator terminals as shown in Figure (3). If the generator positive, negative and zero sequence reactances in per unit are 0.2, 0.21 and 0.05 respectively, find the line currents and phase and line voltages at generator terminals.

(20 Marks)

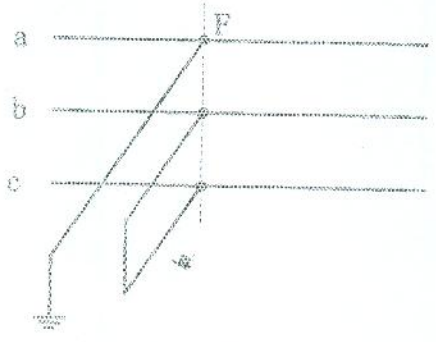


Figure (3)

c) A small generating station has two alternators each of 20 MVA and 15% reactance. The circuit breaker of outing feeders are rated 350 MVA. The system is to be extended by taking supply from a grid area via 15 MVA transformer having 10% reactance. If the same circuit breaker is to be used find the reactance which should be placed between the bus bar section of generating station and the supply from grid. The generating voltage of the station is 11 kV. (10 Marks)

(With My Best Wishes)
Dr. Ibrahim Bedir

Tanta University

Department: Elec. Power and Machines Engineering
Total Marks: 125 Marks

Faculty of Engineering

Course Title: Power system analysis
Date: June 18th 2011 (Second term)

Course Code: EPM3214
Allowed time: 3 hrs

Year: 3rd
No. of Pages: (2)

Remarks: (answer the following questions… assume any missing data… answers should be supported by sketches…etc)

Problem number (1) (30 Marks)

a) **Derive** an expression of swing equation of synchronous machine. (8 Marks)

b) The power transfer from infinite bus to synchronous motor is 0.4 of its maximum power capacity. (i) If the mechanical power is suddenly doubled, find the maximum power angle for motor swing before synchronism at new operating point; (ii) If the mechanical power is returned to its initial value, find the maximum additional mechanical power without causing instability. (10 Marks)

c) A synchronous generator connected to a synchronous motor system through high voltage line as shown in Figure (1). The all system reactances are indicated in per unit. Breakers adjusted to a fault in both sides are arranged to clear simultaneously. (i) determine the critical clearing angle of the generator for a three-phase fault at the point F_1 when the generator is delivering 1.0 p.u. power. Assume that the voltage behind transient reactances of generator and the motor are 1.1 p.u and 1.0 p.u. respectively; (ii) calculate the critical clearing time if H=9 MJ/MVA; (12 Marks)

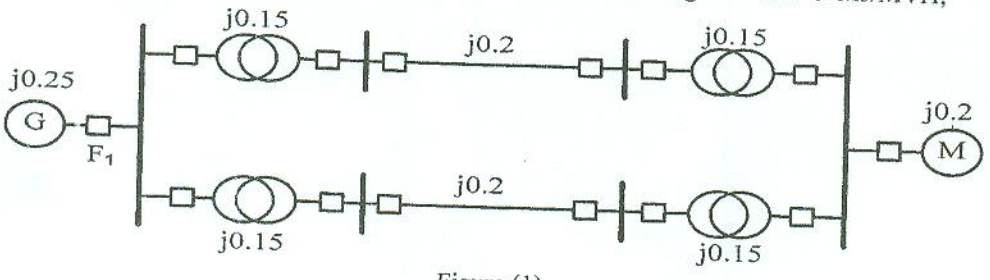


Figure (1)

Problem number (2) (45 Marks)

a) For the power system shown in Figure (2), the one-line diagram of a simple three bus power system with generation at bus 1. If all data given are in per unit:

(i) **find** the bus voltages using Newton-Raphson method (only one iteration required).

(ii) If after several iteration $V_2 = 1.0\angle -6.8605^0$ *p.u.* and $V_3 = 0.9209\angle -9.5796^0$ *p.u.*, **find** the power losses through lines; **finally find** value of Y_c. (35 Marks)

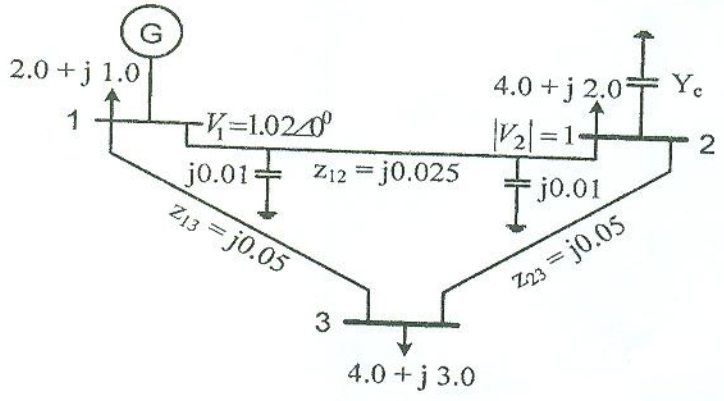


Figure (2)

P. T. O. 1/2

جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج والتصميم الميكانيكى

المادة/ دراسات الجدوى للمشروعات
(EPM32H4)
الفرقة الثالثة(قوى كهربية)

بسم الله الرحمن الرحيم
التاريخ :٢٠١١/٦/٢٨
الزمن : ساعتان

أجب عن الأسئلة الآتية:- (٤٠ درجة)

السؤال الأول:-

١-ماهى العلاقة بين دراسة الجدوى والتخطيط الاستراتيجى.
٢-اكتب نبذة مختصرة عن الجدوى الفنية للمشروع.
٣-تكلم بالتفصيل عن عناصر التصنيع.

السؤال الثانى:-

١- لماذا نقوم باعداد دراسات الجدوى الاقتصادية؟ مع شرح تفصيلى لأنواع دراسات الجدوى الاقتصادية.

٢- تكلم عن :-
(ا)- العوامل المؤثرة فى حجم مرونة الطلب.
(ب)- الخطواط اللازمة لتخطيط مصنع جديد.
(ج)- البيئة التسويقية.

٣- ما هى فوائد اجراء التقييم البيئى؟- وما هى خطوات معالجة الاثار البيئية للمشروع.

السؤال الثالث:-

١- ما المقصود ب المخزون ؟ - ولماذا نحتفظ بالمخزون؟
٢- تكلم باختصار عن وظائف الادارة الخمسة.

- اكتب نبذة مختصرة عن التقرير الخاص بك.

مع أطيب التمنيات بالنجاح
أ.د/عبد الفتاح مصطفى خورشد