University of Technology-Electromechanical Engineering Dept.

Final Exam- 2014-2015

Class: Third

Subject: Advanced Computers

Microprocessor 8086

Examiner: Anmar K. Abrahim

Time:

Date:

note :Attempt only three Questions

Q1 Design a memory system with 1024B RAM and 512B ROM size if you have 256B RAM and 128B ROM Chip size and address lines for CPU is 20 lines.

Q2) PROGRAM USING Matlap

1) $y = \sum_{l=5}^{7} \sum_{k=2}^{5} \frac{(kl)!}{k!+l!}$

2) $Z = 2 - \sum_{1}^{n} \sum_{2}^{m} sin^2(x) \sum_{6}^{k} ln(y) \qquad if\ x < 2$

Q3)

1)PROGRAM USING Matlap

$Z=1-(X^2/2!)+(X^4/4!)-(X^6/6!)+(X^8/8!)$

2) what the state of flags

MOV AX,1256

MOV BX,3456

SUB AX,BX

Q4 Show the effect before and after execution of the instructions below if you know that CS=1133H, DS=2944H, SS=4467DH, IP For Second Instruction =5561H, BX=7A2DH, SI=5498H, AX=8811H, CX=6493H, DI=3494,DX=2393,BP=8896, Data location for first instruction= 5432H, SP=3456,

Data location for third Instruction= 65BEH,

Data location for Fourth Instruction= 0AED2H

MOV AX, [BX]+[SI]+[1166H] OPCODE=FF12H

ADD CX, DX OPCODE = AEH

XCHG [SI]+[0ECC1H] , AX OPCODE=90H

ADD [BP]+[DI]+[4423H],BX OPCODE=1234H

Push AX OPCODE=52H

PoP CL OPCODE=60H

With Good Luck

University of Technology-Electromechanical Engineering Dept.
Final Exam.First Attempt 2014-2015 [form1]

Class:3rd year
Subj.Combustion& Air Pollution
Examinar:Dr.Hassan

Time: 3 hours
Date: /6/2015
Answer four Questions only

Name: ID No. Signature

Q1/(a)Explain and discuss on which parameters are depend the formation of NO_x

(b)propanol C_3H_7OH are used in an engine with excess air 120%. Theoretical maximum combustion temperature are 2390 K at an equivalence ratio 0.83.To reduce formation of NO_x ,it is desired to reduce this maximum temperature to 2200 K.This is done by exhaust gas recycling EGR.The exhaust gas that consists mostly of N_2,CO_2 and H_2O will be approximated as all nitrogen of atemperature of 1000 K.If the calculated values of moles of EGR x-moles of N_2 at 1000 K are 18.88, calculates:

1.the percentage amount of EGR needed to reduce maximum combustion temperature to 2200 K

2.the total fraction of exhaust in the cylinder during the compression stroke if the residual gas coefficient x_r =0.02 [15 mark]

Q2.Methan CH_4 is burnt in air with an equivalence ratio $\emptyset = 1.15$ .Determine

1.the equilibrium composition of the products at 2200K .

2.the percentage of the product molar composition

assume that the product equilibrium mixture consists of CO_2 , H_2O , CO and H_2.Take into consideration the water gas reaction to find dissociation constant.

$CO_2 + H_2 \leftrightharpoons CO + H_2O$ [15 mark]

use $k_{wg} = 5.2$ at T=2200 K

Q3/(a)Discuss and explain the undesirable emissions generated in the combustion process of combustion engine, discuss also the major causesof these emissions.

b) Discuss &explain the main factors effecting the rate of burning and pressure rise during 2-nd stage of combustion in a diesel & petrol engine. [15 mark]

Q4/(a)Determine the approximate A/F ratios by mass, and the wet and dry products of combustion,for weak and rich mixture of heptene C_7H_{14} ,which have respectively:

(1) 8% excess air ,assuming no CO & H in product

(2)12% in sufficient air ,assuming no oxygen & hydrogen in products.

(b)Discuss & explain the Exhaust Gas Recycle (EGR) method for reducing NO_x emission. [15 mark]

Q5/(a)A mixture of fuel with volumetric composition of 0.278 methanol CH_3OH and 0.722 gasoline C_8H_{15} is burned in four cylinder petrol engine with air at an equivalence ratio $\emptyset = 0.95$. Assuming no carbon monoxide CO & hydrogen in the products .Write down the complete balanced chemical equation of combustion and calculate the air to fuel ratio during engine operation.

(b)Explain and discuss the meaning of the following parameters

1.ignition delay period 2.equivalence ratio 3.bmep [15mark]

University Of Technology –Electromechanical Engineering Dept.

Final Exam 2014-2015

Class: *3th Energy and renewable Energy*

Time: *3-hours*

Subject: *Control theories& Vibrations*

Date: *2015*

Examiner: ***Dr. Aseel J. M. Alhassani***

Note: *Answer 4-Question Only*

Name: ***ID. No. :*** ***Signature:***

Q_1

a : Obtain the Unit-step response of a unity-feedback whose open-loop transfer function is $G(s)=5(s+2)/s(s+4.59)(s^2+3.41s+16.35)$ .Find also the steady-state value of the Unit-Step response.? *8(Deg.)*

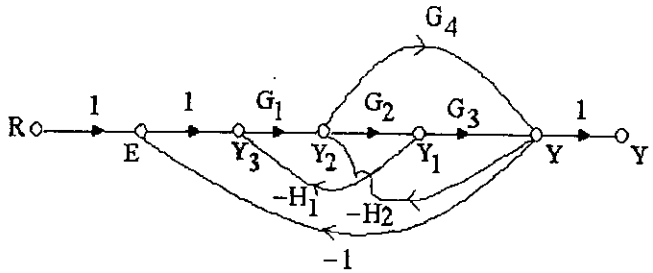
b: The transfer function for single loop non unity feedback control system are given as $G(s)=1/(s^2+s+2)$,and $H(s)=1/(s+1)$, Find the steady-state errors due to a unit-step input, a unit-ramp input and a Parabolic input?*7(Deg.)*

Q_2

Find T.F. from the following *system* with:

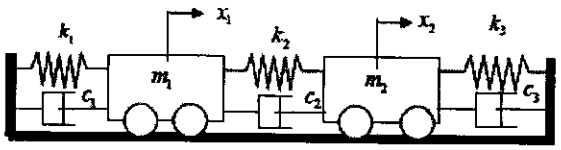
a) Block diagram reduction? *8 (Deg)*

b) *Mison* gain formula ? *7(Deg.)*



Q_3

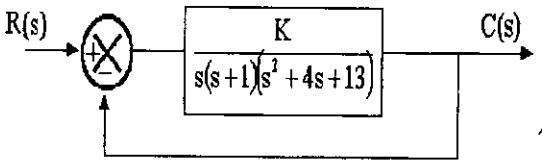
a) for two degree of freedom system shown in figure ,find equation of motion by matrices technique ? *8(Deg)*



b) A car mass *2000 Kg* its spring deflection *0.02 m* under static conditions find the natural frequency? *7(Deg)*

Q_4

a : Sketch the root loci for the system shown in Fig.? *8(Deg.)*

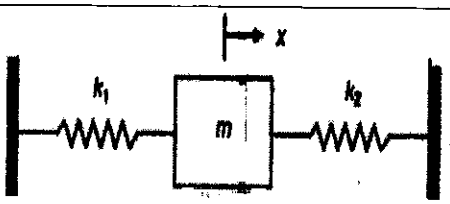


b :Find the Bode magnitude plot if The transfer function is : *7(Deg.)*

$$\frac{10^2(s+1)}{(s+10)(s+100)}$$

Q_5

a) Determine the natural frequency for the system shown if $m=2Kg$,$K_1=3N/m$, $K_2=3N/m$? *8(Deg)*



b) Determine the natural frequency when a damper *(c)* is added beside the spring K_1 ? *7(Deg)*

University of Technology-Electromechanical Engineering Dept.
Final Exam– 2014-2015

Subject: Industrial Engineering
Examiner: Dr K. I.Mahmoud

Time: 3 Hours
Class: 3 rd years (Energy & Systems)

Note: **Answer Five Questions**

Q1 - Following linear programming problem, solves it by using the graphic method.

(14 Marks)

$$\text{Minimize} \quad Z = 2X_1 + 4X_2$$

subject to:

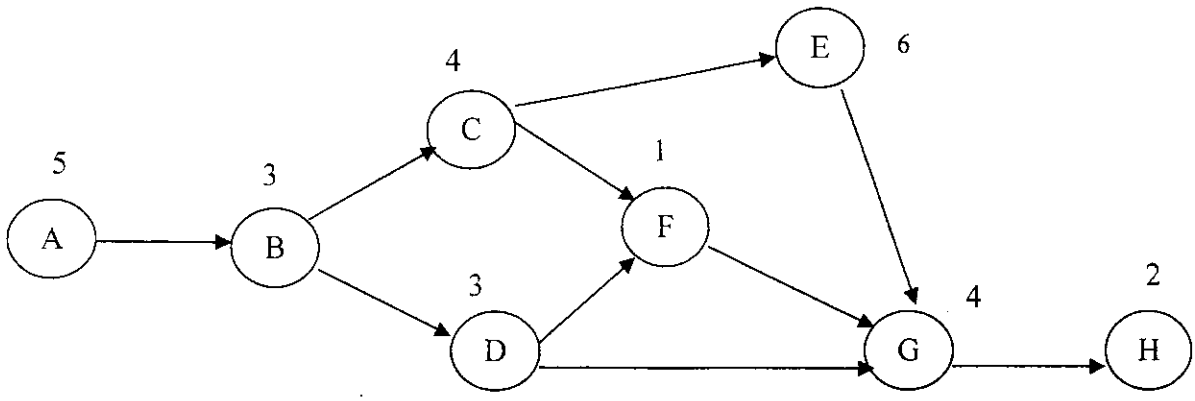
$$X_1 + X_2 \le 14$$
$$3X_1 + 2X_2 \ge 30$$
$$2X_1 + X_2 \le 18$$
$$X_1 \ge 0 \quad , \quad X_2 \ge 0$$

Q2- Suppose that an Engineer has five jobs that can be performed on any of five machines. The cost ($) of completing each job-machine combination is below. Find the assignment.

Job	Machine				
	A	B	C	D	E
J1	5	6	4	8	3
J2	6	4	9	8	5
J3	4	3	2	5	4
J4	7	2	4	5	3
J5	3	6	4	5	5

(14 Marks)

Q3- The Boeing 737 wants to balance an electrostatic wing component that requires a total assembly time of 28 minutes. The precedence diagram and assembly times below:



In addition to the precedence constraint there is a zoning constraint: Task C and Task D cannot be allocated in the same work station. According to this information, an engineer designer suggested five (solutions) assembly line balances as shown in the table. Which balance should be recommended? Explain the reason of your choice, and determine the values: Ct, K, L.FFF, and BD of your choice.

Work station	Balance (1)	Balance (2)	Balance (3)	Balance (4)	Balance (5)
1	A, B	A, B, D	A, B	A, B, C, D	A, B, F
2	C, D	C, E, F	C, E	E, F, G, H	C, E
3	F, E	G, H	D, F		D, G, H
4	G, H		G, H		

(14 Marks)

Q4- Consider the following engineering project:

Activity	Immediate Successor Activity	Time (week)
A	B , C	2
B	D, E	1
C	D,E,F,H	1.5
D	-	4
E	G	7
F	G	2.5
G	-	6
H	-	2

1-Find the critical path.

2- Suppose that activity E can not start until D has been completed, what is the effect on the project?

(14 Marks)

Q5: The producer of electronic circuits has decided to use process control by variables. For variable control a circuit voltage will be measured based on a sample of only five circuits. Five samples of voltage are taken with the following result.

1-Determine UCL, LCL for $\bar{X}$ - chart and R- chart.

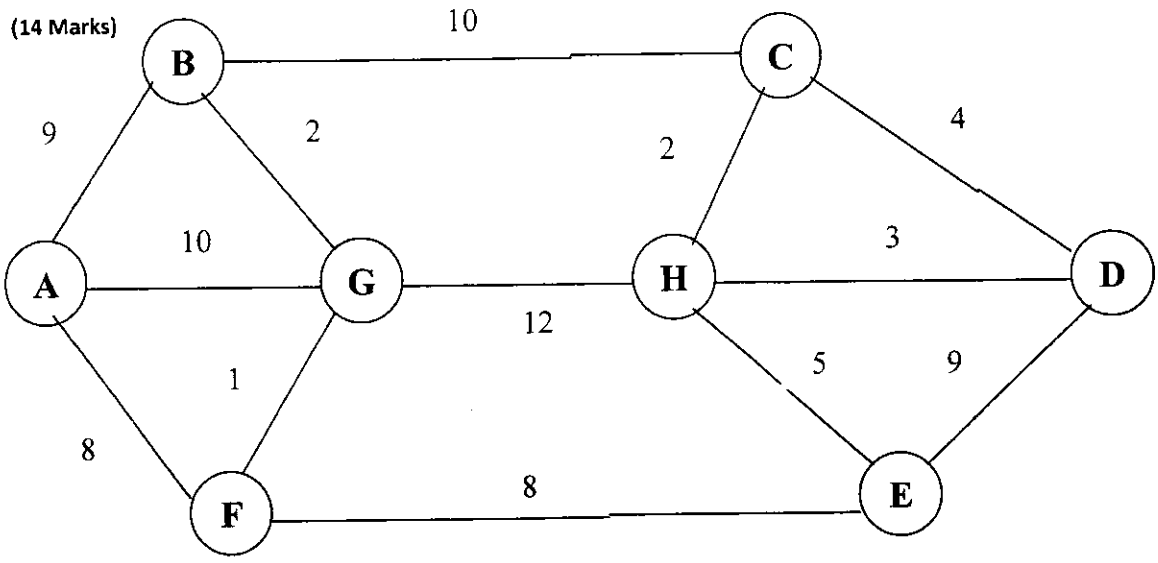
2-Draw the chart (Given for n=5, A_2= 0.58, D_3= 0, D_4= 2.11).

Sample	1	2	3	4	5
$\bar{X}$	3.6	3.3	2.6	3.9	3.4
R	2.0	2.6	0.7	2.1	2.3

(14 Marks)

Q6- The diagram blew is graph showing 8 computer terminals A,B,....H. with the figures representing the distance in meters between the various computers. With using Prim's Algorithm, find the minimal spanning tree.

(14 Marks)



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FINAL EXAMINATION OF PROTECTION SYSTEMS
2014-2015

UNIVERSITY OF TECHNOLOGY
ELECTROMECHINCAL ENGINEERING DEPARTMENT
CLASS: 3 rd YEAR

ASSIST. PROF. DR. HUSSEIN T. RISHAG
ENERGY & RENEWABLE ENERGY BRANCH
TIME ALLOWED: 3 h

Name: **Signature:**

Note: Answer only SEVEN questions

Q1- Put true or false then correct each false.

a) The value of fusing factor is always low than unity.
b) Buchholz relay can detect faults below oil level in the transformer.
c) The fuse melts well after the first peak of fault current is reached.
d) Balanced earth-fault protection is generally provided for large-size generators.
e) The fuse element is generally made of silver. (10) d

Q2- What are the types of voltage transformers and current transformers (list them), and draw the figure of each one. (10) d

Q3- What is lightning? Discuss the principle, construction and action of lightning arresters, with the figure, and list types of lightning arresters. (10) d

Q4- A star-connected, 3-phase,10 MVA, 6.6 KV alternator is protected by circulating current protection, the star point being earthed via a resistance r. Estimate the value of earthing resistor of 85% of the stator winding is protected against earth faults. Assume an earth fault setting of 20%. Neglect the impedance of the alternator winding. (10) d

Q5- Describe the fault-bus protection of B.B protection, with the figure.

(10) d

Q6- Describe a suitable protective system for a ring main formed by a power station and four substations, and explain clearly its working when a fault occurs, with the figure.

(10) d

Q7- Fig (1), given that fault current =2000 A; Relay 1 set on 100%; CT ratio= 200/1; Relay 2 set on 125%. For discrimination the time gradient margin between the relays in 0.5 second. Determine the time of operation of the two relays assuming that both the relays have the characteristic as shown in the following table and the Relay 1 has a time multiplier setting=0.2.

Plug setting multiplier	2	3.6	5	8	10	15	20
Time in seconds for a time multiplier of 1.	10	6	3.9	3.15	2.8	2.2	2.1

Also determine the time setting multiplier of Relay no.2.

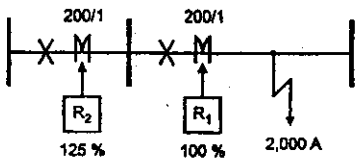


Fig (1)

(10) d

Q8- The three phase (11 kV, 500 MVA) circuit breaker suddenly closes on to a fault. Determine (a) the symmetrical breaking current; (b) the asymmetrical breaking current assuming 50% dc component; (c) the peak making current; (d) the short-time current rating. (10) d

GOOD LUCK

ASSIST. PROF. DR. HUSSEIN T. RISHAG

ثالث طاقه
٦/٧
مكائن موائع

University of Technology **Department of Electromechanical Engineering.** **Final Exam 2014 -2015** **Date: 7 / 6 / 2015**	بسم الله الرحمن الرحيم	**Energy Engineering, B.Sc.** **Subject: Fluid Machinery** **Time Allowed: 3 hrs.** **Examiner: Dr. Abdullateef A.** **Dr. Hussein Majeed** **Sample :**

التوقيع: رقم الهوية: اسم الطالب :

Note 1: Answer only five questions! **Note 2: Necessary sketches are required!**

Q1) (A) Select the correct answers for the following questions:

1. The ratio of power outlet of the pump to the power input to the pump is known as
   (a) Mechanical efficiency (b) overall efficiency (c) Manometric efficiency (d) none of the aforementioned.
2. In a centrifugal pump the sum of suction head and delivery head is known as
   (a) Manometric head (b) total head (c) static head (d) none of the aforementioned.
3. Pelton turbine is a
   (a) Reaction turbine (b) Impulse turbine (c) Radial flow turbine (d) Axial flow turbine.
4. Example of a pure reaction turbine is
   (a) Francis turbine (b) Propeller turbine (c) Kaplan turbine (d) Lawn sprinkler.
5. The value of speed ratio (Ku) in case of a Francis turbine ranges from
   (a) 0.2 to 0.3 (b) 0.4 to 0.5 (c) 0.6 to 0.9 (d) none of the aforementioned.
6. Which of the following turbines is most efficient under part load conditions:
   (a) Kaplan (b) Propeller (c) Francis (d) Pelton.

(B) Prove that the pressure coefficient for a centrifugal compressor may be written as:

$$\psi_p = \psi . \eta_c . \sigma_s$$

Q2) A jet of water, 60 mm in diameter, strikes a curved vane at its centre with a velocity of 18 m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate to be smooth, find:

(i) Thrust on the plate in the direction of jet,
(ii) Power of the jet, and
(iii) Efficiency of the jet.

Q3) In an inward flow reaction turbine the diameter of the outer periphery is two times the diameter of inner one, and the turbine operates under a head of 20 m. The turbine has radial tips at the inlet while at the exit the blades make an angle of 30° with the forward tangent. Assuming a constant radial velocity of flow and that the blade friction accounts for a dissipation of energy equivalent to 10 percent of kinetic energy at the outlet, determine :

(i) Runner velocity at the rim, and
(ii) Hydraulic efficiency of the turbine.

Assume the turbine discharges radially at the outlet

Q4) In order to predict the performance of a large centrifugal pump, a scale model of one - sixth size was made with the following specifications: Power P = 25 kW; Head H_{mano} = 7 m; Speed N = 1000 r.p.m. If the prototype pump has to work against a head of 22 m, calculate its working speed, the power required to drive it, and the ratio of the flow rates handled by the two pumps.

Q5) A centrifugal pump is delivering 0.216 m^3/s of water against a head of 18 m; the speed of rotation of impeller being 600 r.p.m. The diameters at outer and inner periphery of the impeller are 600 mm and 300 mm respectively. The area of flow is constant at 0.084 m^2 from inlet to outlet of impeller. If the vanes of the impeller are bent at an angle of 35° to the tangent at exit, determine:

(i) Manometric efficiency,

(ii) Inlet vane angle, and

(iii) Loss of head at inlet to impeller when the discharge is reduced by 35 percent

Q6) The bore and stroke of a reciprocating pump are 250 mm and 500 mm respectively. The pump delivers water through a 100 mm delivery pipe to a tank located at 14 m above it and 27 m horizontally from it. If separation occurs at a pressure of 22 kN/m2 absolute, find the safe speed at which the pump should run for the following arrangements of delivery pipe: (i) The delivery pipe is horizontal from the pump and the vertical up to the tank and (ii) The delivery pipe is vertical from the pump and then horizontal up to the tank. The atmospheric pressure at the pump site = 10.3 m of water.

BEST LUCK!

University of Technology-Electromechanical Engineering Dept.

Final Exam. 2014-2015

Class: 3rd year
Subject: Power system
Examiner: Dr. Sadi T. Kurdi

Time: (3) hours
Date: / /2015
Note: Attempt (5)question.

Name: ID No. Signature

Q_1. (14) Mark

A central station is supplying energy to a community through two substations. Each substation feeds four feeders. The maximum daily recorded demands are:

Power station..... 12,000 Kw.

Substation A ..... 6000 kW	Sub-station B.... 9000 kW
Feeder 1 ..... 1700 kW	Feeder 1 ..... 2820 kW
Feeder 2 ..... 1800 kW	Feeder 2 ..... 1500 kW
Feeder 3 ..... 2800 kW	Feeder 3 ..... 4000 kW
Feeder 4 ..... 600 kW	Feeder 4 ..... 2900 kW

Calculate:

The diversity factor between:

(i) Substations.(A and B)
(ii) Feeders on substation. (A)
(iii) Feeders on substation (B).

Q_2. (14) Mark

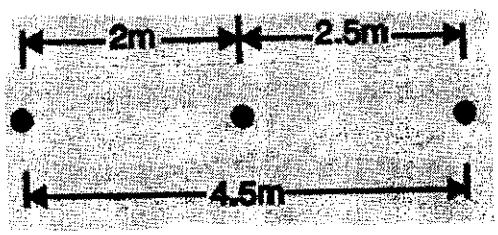
a) What is corona? What are the factors which affect corona?
b) Estimate the corona loss for a three-phase, 110 kV, 50 Hz, 150 km long transmission line consisting of three conductors each of (10 mm) diameter and spaced (2·5 m) apart in an equilateral triangle formation. The temperature of air is (30°C) and the atmospheric pressure is (750 mm) of mercury. Take irregularity factor as (0·85). Ionization of air may be assumed to take place at a maximum voltage gradient of (30 kV/cm).

Q_3. (14) Mark

A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal Plane as shown in Fig. below The conductor diameter is (1·25 cm).If the line length is (100 km).

Calculate:

(i) Capacitance per phase,
(ii) Charging current per phase, assuming complete transposition of the line.



Q4. (14) Mark

A 2-wire d.c. distributor AB (500 m) long is fed from both ends and is loaded uniformly at the rate of (1·0 A/m). At feeding point (A), the voltage is maintained at (255 V) and at (B) at (250 V).If the resistance of each conductor is (0·1 Ω per kilometer).

Determine:

(i) The minimum voltage and the point where it occurs.

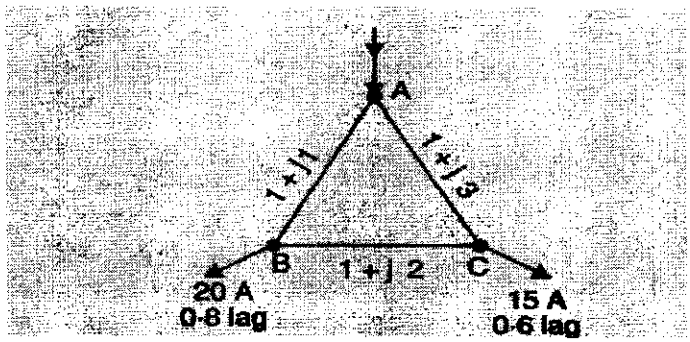
(ii) (ii) the currents supplied from feeding points A and B

Q5. (14) Mark

A single phase ring distributor ABC is fed at (A) as shown in Fig below. The loads at (B) and (C) are (20 A) at 0.8 p.f. lagging and (15 A) at 0.6 p.f. lagging respectively; both expressed with reference to the voltage at (A). The total impedance of the three sections (AB), (BC) and (CA) are (1 + j 1), (1+ j2) and (1 + j3) ohms respectively.

Find:

The total current fed at (A) and the current in each section. Use Thevenin's theorem to obtain the results.



Q6. (14) Mark

The capacitances of a 3-phase belted cable are (12·6 μF) between the three cores bunched together and the lead sheath and (7·4 μF) between one core and the other two connected to sheath.

Find:

(i) The charging current drawn by the cable when connected to (66 kV), 50 Hz supply

(ii) The (KVA) taken by 20 km long cable when connected to 3-phase, 50 Hz 3300v supply.

Good luck

الجامعة التكنولوجية- قسم الهندسة الكهروميكانيكية

University of Technology - Electromechanical Engineering Dept.

Final Exam –**Sample No.(1)**- 2014/2015

Class: 3rd Electro mechanics/ Power
Subject: Eng. & Numerical Analysis
Examiner: Dr. Mustapha Sami.

Time: 3 hours
Date: / / 2015
Note: Answer **FIVE** questions **only**

Name:	Signature:

Q1: **14 Marks**

Solve the system of equations:

$$x_1 + 10x_2 - x_3 = 3$$
$$2x_1 + 3x_2 + 20x_3 = 7$$
$$10x_1 - x_2 + 2x_3 = 4$$

Using the *Gauss elimination method* with partial pivoting.

Q2: **14 Marks**

Apply the method of least squares to fit a straight line relationship for the following points:

x	-2.4	-0.8	0.3	1.9	3.2
y	-5.0	-1.5	2.5	6.4	11.0

Q3: **14 Marks**

(a) Obtain a numerical solution, using Euler's method, of the differential equation:

$$\frac{dy}{dx} = y - x,$$

With the initial conditions that at $x = 0, y = 2$, for the range $x = 0\ (0.1)\ 0.5$.

(b) By an analytical method, the solution of the above differential equation is given by $y = x + 1 + e^x$. Determine the percentage error at $x = 0.3$.

Q4: **14 Marks**

Solve the following ordinary differential equation by power series:

$$y' = 2xy$$

Q5: **14 Marks**

Use the mid-ordinate rule, correct to *3 decimal places,* to evaluate the following:

$$\int_1^3 \frac{2}{\sqrt{x}}\, dx \text{, with;}$$

(a) 4 intervals. ***(b)*** 8 intervals.

Q6: **14 Marks**

Using the **Newton-Raphson** method to compute $\sqrt[3]{75}$ with four significant accuracy.

University of Technology-Electromechanical EngineeringDept.

Final Examination

Class:3rdYear – Electromechanical Eng.
Subject: power plant
Examiner: Ass.Prof. Dr.Shaker H.Aljanbi

Time:3hr
Date: / /2015
يسمح باستخدام جداول ومخططات البخار

NOTE ***Answer four questions only***

Q1 :-A) With the aid of h-s and T-s diagrams, explain in some details the effect of irreversibility in the steam plant.

B) The expansion in a turbine is adiabatic an irreversible. The entropy at the inlet is 6.939kJ/kg.K, and the turbine exhaust at a pressure of 7 kN/m^2. If the dryness fraction of the steam at exhaust is 0.91, calculate the lost of work due to irreversibility. If the inlet pressure is 4MPa, what is the isentropic efficiency?

Q.2) A certain factory has an average load of 1.5 MW and requires 3.5 MW for heating process (fig.1). It is proposed to install a single extraction steam turbine to operate under the following conditions; Initial pressure 1.5 MPa; initial temperature 300 ^{0}C, and condenser pressure of 0.01MPa. Steam is extracted between the two turbines at 0.3MPa, 0.96 dry, and is isobarically cooled in heater to supply the heating load. The efficiency of L.P turbine is 8o% and the boiler efficiency is 85% when using oil of a calorific value of 44 MJ/kg.

If10% of boiler steam is used for the auxiliaries; calculate the oil consumption in ton per day. Assume that the condensate from heater at 0.3MPa, and that from condenser mix freely in a hot well before being pumped to the boiler.

Q3;A) Superheated steam enters a supersonic nozzle at 2MPa, 400^{0}C, and expanded to a pressure of 0.2MPa according to the law $Pv^{1.3}$ =constant. Find for 6.2 kg/s of steam flowing through the nozzle, the shape of the nozzle. Draw the distribution of flow parameters along the axis of such nozzle.

B) The feed water to a boiler enters an economizer at 32^{0}C and leaves at 120^{0}C, being fed into the boiler at this temperature. The steam leaves the boiler 0.95 dry at 2MPa and passes through superheated where its temperature is raised to250 ^{0}C without change of pressure. The steam output is 8.2kg/kg of coal burned and the Calorific value is 28 MJ/kg. Calculate the energy picked up per kg of water and steam in the economizer, the boiler and the super heater, expressing the answer as a percentage of the energy supplied by the coal.{take C_{pw} =4.187 kJlkg.K }.

Q.4; A) Show mathematically, for a simple gas turbine plant, that the specific work output is maximum when the pressure ratio is such that the compressor and turbine outlet temperatures are equaled.

B) An axial thrust of (-100)N/kg of steam effects on the simple impulse turbine. The inlet whirle, flow and relative velocities are 1315 m/s,495 m/s and 1100m/s respectively. If the discharge angle is 35^0 ,draw a velocity diagram, determine; ; the blade speed, nozzle angle, velocity coefficient, all velocities and angles and blade efficiency.

0.7692

0.23

Q5) A gas turbine- power plant employ two stage compression and expansion, with inter cooling, reheating and regeneration. The temperature at the outlet of the compressor second stage is 390 ^{0}K, and the combustion chamber inlet temperature is 750 ^{0}K.The turbine inlet temperature is limited to 1180 ^{0}K. Note that for the gas, use γ=1.4and R=0.287kJ/kg.K.Draw a line diagram and T-s diagram for the plant then.

a) Determine the gross maximum work out-put from the two stage turbine.if the overall pressure ratio is 6:1.

b) Determine the regenerative effectiveness.

GOOD LUCK

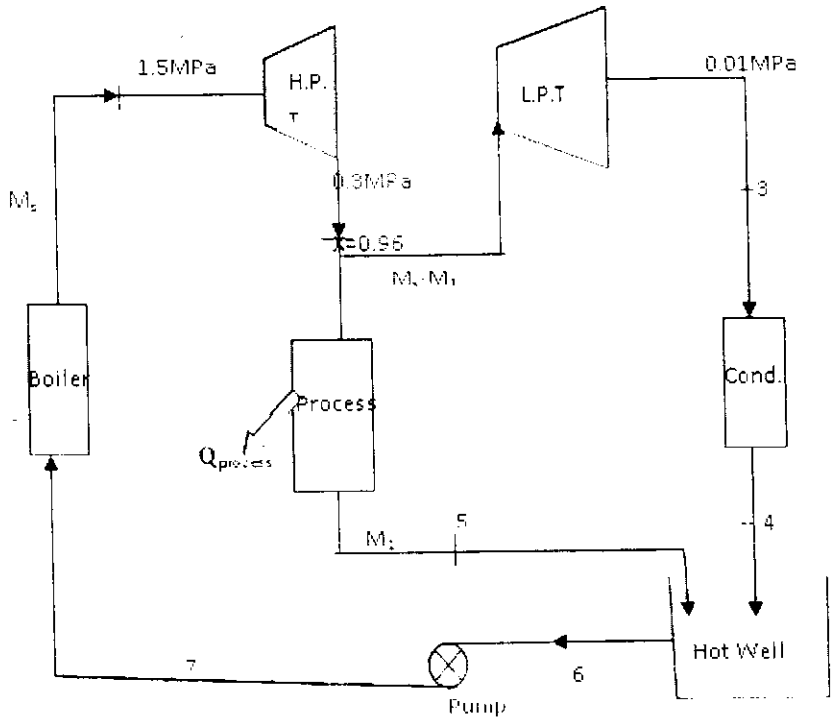


Fig.1