ثالثة قوى (قديم) ٢٠٠٩/١/٢٩ نظم تحكم آلى

Tanta University
Faculty of Engineering
Department of Electrical power
third Year (old)

Subject : Automatic control
Date: 29-01-2009
Time 3 hours
Final Term Exam
Number of pages 2

Answer the following questions:

1-

a) Drive the transfer function and block diagram for PID control.

b) Discuss briefly the open and closed loop control system and what the differences between them are. Give example of each type?

2-

a) For the circuit shown in Fig 1
   1) Obtain the transfer function?
   2) Draw the equivalent block diagram?

b) For block diagram shown in Fig 2
   1) Based on block diagram reduction, Determine the overall transfer function?

3- Let the linear time invariant system is described by.

$$\frac{dx(t)}{dt} = Ax(t) + B(t), \text{ with } A = \begin{bmatrix} 1 & -1 \\ 0 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

a) Transfer this state equation into phase-variable canonical form.
b) Find the non-singular matrix P that transforms "A" into diagonal form.

4- A system described by

$$\frac{dx(t)}{dt} = Ax(t) + B(t), \text{ with } A = \begin{bmatrix} 1 & -1 \\ 0 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$y = cx(t) \qquad C = [1 \quad 0]$$

a) Test the controllability and the observability for this system?
b) Design a state feedback controller that has an un-damped natural frequency of 10 rad/s and a damping ratio of 0.5?
c) Design a full-order observer that has an un-damped natural frequency of 5 rad/s and a damping ration of 0.25?

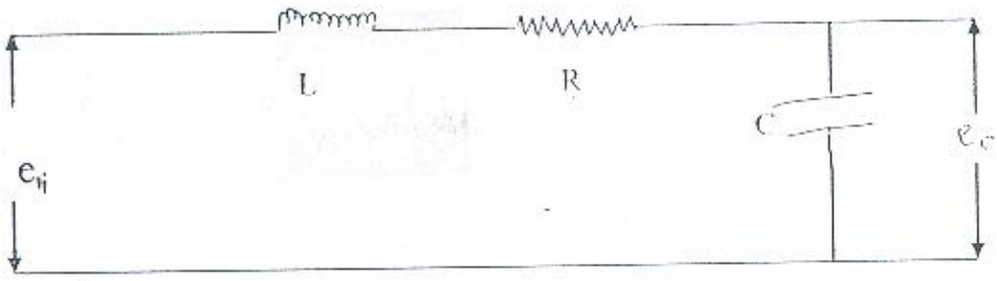

Fig (1)

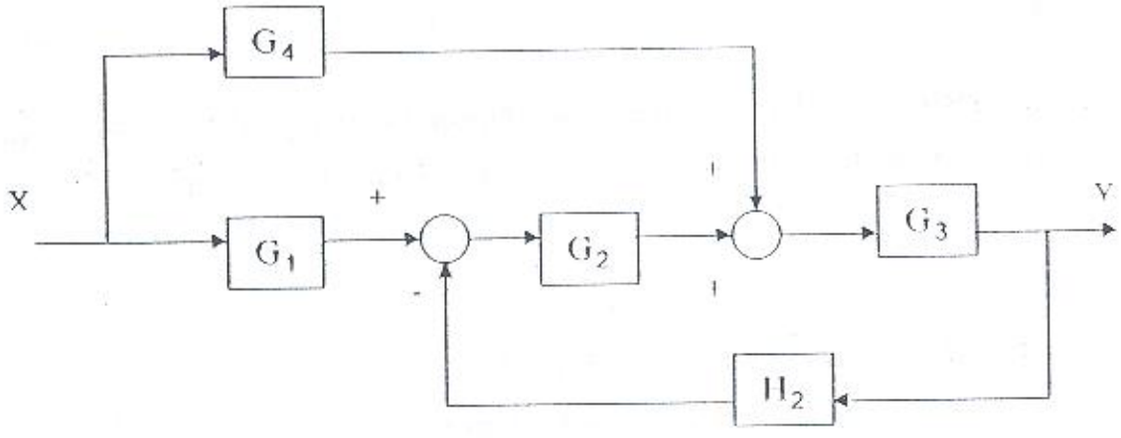

Fig (2)

With my best wishes

Dr. Magdy G. El-ghatwary

Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952

Values of $t_{\alpha,\nu}$[†]

ν	$\alpha = .10$	$\alpha = .05$	$\alpha = .025$	$\alpha = .01$	$\alpha = .005$	ν
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15

25/1/2020 موعد التسليم

Tanta University
Faculty of Engineering
Electrical Power and Machines Engineering

Electrical Machines
(Old Curriculum)
Third Year/ First Term/ Final Exam
Time:3:00 hr Max Marks: 85

Attempt All Questions

Question 1: Marks: **[25]**

a- Explain the principle of operation of double cage motor. [6]

b- What are the different methods used to control the speed of three-phase induction motor? Clarify the principle of each method with equations and graphs. [9]

c- A three phase, 230V, 60Hz, 6 pole, Y connected induction motor has the following parameters in ohm per phase referred to the stator side: [10]

R_1=0.5Ω R'_2=0.25Ω X_1=0.75Ω X'_2=0.5Ω X_m=100Ω

The total friction, windage and core losses can be assumed to be constant at 250W. When the motor is running at its rated slip of 2.5%, determine:

1- motor input current
2- input power factor
3- rotor cupper loss
4- airgap power
5- efficiency

Question 2: Marks: **[15]**

a- The power transferred across the airgap of a two pole three phase induction is 24kW. If the electromagnetic power developed is 22kW, find the slip. The rotational loss at this slip is 400W. Calculate the output torque. [5]

b- A 110V, 3-phase, start-connected induction motor takes 25A at a line voltage of 30V with rotor locked. With this line voltage, power input to motor is 440W and core loss is 40W. The DC resistance between a pair of stator terminals is 0.1Ω. If the ratio of AC to DC resistance is 1.6, construct the equivalent circuit of the motor. Assume stator leakage reactance and rotor leakage reactance -referred to stator side- are equal. Find the slip of maximum torque. [10]

Question 3: Marks: **[15]**

a- Numerate the different methods of three phase synchronous motor starting. Support your answer with illustrators. [5]

b- Discuss the necessary conditions for parallel operation of synchronous generators. [5]

c- Show how to utilize start delta switch for three phase induction motor starting. Draw necessary diagrams. Discuss the effect of this starting technique on starting torque. [5]

Question 4: Marks: **[15]**

a- Explain the relation between the excitation current, phase current and power factor of three phase synchronous motor. [7]

c- Calculate the pitching and distribution factors of three phase synchronous generator with 96 stator slots, 6 poles, coil span 1 to 12. There are 8 conductors per slot connected in two layers. Calculate the fundamental induced voltage per phase when the generator runs at 62.5 RPM. Flux in the airgap is 25mWb. [8]

Question 5: Marks: **[15]**

a- In a 50-KVA, star-connected, 440V, three phase, 50Hz alternator, the effective armature resistance is 0.25Ω per phase. The synchronous reactance is 3.2Ω per phase and leakage reactance is 0.5Ω per phase. Determine at rated load and unity power factor: [7]

1- internal EMF
2- percentage regulation on full load
3- value of synchronous reactance which replaces armature reaction

b- A75-Kw, three phase, Y-connected, 50Hz, and 440V cylindrical rotor synchronous motor operates at rated conditions with 0.8 power factor leading. The motor efficiency excluding field and stator losses is 95% and X_s= 2.5Ω. Calculate: [10]

1- mechanical power developed
2- armature current
3- induced voltage
4- power angle

With Best Wishes

جامعة طنطا - كلية الهندســـة
قسم هندسة القوى والالات الكهربية

امتحان الفصل الدراسى الأول للعام الجامعى ٢٠٠٨/٢٠٠٩
امتحان مادة اختبارات وقياسات كهربية (أ)
للفرقة الثالثة قوى كهربية (لائحة قديمة)

التاريخ : ٢٧-١-٢٠٠٩ الزمن: ٣ ساعات

Answer the following questions:

1-a) Explain why the current transformers are designed for loads with very low resistance, and may never be operated with open circuit on their secondary side.

b) List the different losses occurring in a current transformer and how these losses can be reduced.

c) Discuss the construction and principle of operation of clampmeter.

2-a) Define what is meant by matched load.

b) What is the difference between power transformer and voltage transformer in construction and characteristic of operation.

c) Discuss the effect of reduction of load resistance on the line end voltage for each inductive load. Draw the phasor diagram of the current-voltage for the different values of inductive load and what happen when the load becomes pure inductance.

3-a) Discuss the advantages and disadvantages of the reactive power from supply.

b) Discuss the effect of capacitive and inductive shunt compensation on the load.

c) Draw the phasor diagram to study the effect of the series capacitor on the voltage regulation,

4-a) Discuss the advantages and the disadvantages of connecting the capacitors in both series and parallel with the load.

b) What are the conditions required for Bus-Bar coupling in power system?

c) Write the experiment of double Bus-Bar.

Tanta University *Faculty of Engineering* *Physics & Mathematics Dept.* *Third Year Elec. Power & Comm.* *Final First Term Exam*	*Engineering Mathematics* *Code : لائحة قديمة* *Date : 22/1/2009* *Total Mark : 85* *Time Allowed: 3 Hours*

Answer the following questions:

[1] (20 Marks)

(a) A box contains 2000 components of which 100 are defective, second box contains 500 components of which 200 are defective, two other boxes contains 1000 components each with 100 defective components. We select one box at random and remove from it at random a single component, if it was defective what is the probability that it was drawn from box 1 or3?

(b) If $P(A)=0.4$, $P(A \cup B)=0.7$ and $P(B)=p$ find the value of p if

i) A and B are mutually exclusive
ii) A and B are independent

(c) The mean and variance of binomial distribution are 4 and 3 respectively; find $P(x \geq 1)$.

[2] (25 Marks)

(a) Use the moment generating function to obtain the mean and variance of the random variable X whose density function is given by:

$$f(x)=\frac{1}{2}e^{-|x|}, \qquad -\infty < x < \infty$$

(b) If X is a random variable its density function is given by

$$f(x)=\begin{cases} kx(1-x), & 0 < x \leq 1 \\ 0, & \text{otherwise} \end{cases}$$

i) Find the value of k.
ii) Find the cumulative distribution function>
iii) Find $P(x<0.2)$

(c) Derive a formula for the mean, variance and moment generating function for the Poisson distribution.

[3] (20 Marks)

(a) If $X \sim N(\mu, \sigma^2)$, such that $P(\mu-k\sigma \leq x \leq \mu+k\sigma) = 0.823$; find the value of k.

(b) Suppose that 5% of all items coming off a production line are defective. If 10 such items are chosen and inspected, what is the probability that at most 3 defective items are found?

(c) The grads of a class of 9 students on a midterm examination (X) and on the final examination (Y) are as follows:

Midterm (X)	77	50	71	72	81	94	96	99	67
Final (Y)	82	66	78	34	47	85	99	99	68

i) Compute the correlation coefficient.
ii) Find the linear prediction equation.
iii) Estimate the final examination grade pf student who received a grade of 85 on the midterm examination.

[4]	(a) A machine is producing metal pieces that are cylindrical in shape , a sample of pieces is taken and the diameters are 1.01, 0.97, 1.03, 1.04, 0.99, 0.98, 0.99, 1.01, 1.03 centimeters, find a 95% confidence interval for the mean diameter of pieces from this machine.
20 Marks	(b) All boxes of a certain type of coffee indicate that they contains 21 grams of coffee, a government agency receives many consumer complaints that the boxes contain less than 21 grams. To check the consumer complaints at the 5% level of significance, the government agency buys a sample of 100 boxes of this coffee and finds that the sample mean is 20.5 grams with a standard deviation of 2 grams. Should the government agency order the seller to put more coffee into its boxes?
	(c) If we have a finite population of five observations 3, 5, 7, 9, 11; find the sampling distribution of the mean if we draw a random sample of size 3.

Tanta University
Faculty of Engineering
Third year
Full mark: 85

Subject: Economic operation of power systems
Final examination 2008-2009
Time allowed: Three hours
Date: 18/1/2009

لائحة قديمة

(1-a) Choose the best answer: (2 marks each)

(i) The diversity factor for a large number of loads may be in the range of:

a) 1.0 b) 1.02 c) 1.1 d) 1.5 e) 2

(ii) The capacity factor can be used to calculate:

a) average demand b) rated capacity d) maximum demand c) connected load

(iii) Reserve power can be obtained from:

a) standby units and boilers b) speed governor c) valve position d) boilers

(iv) The load factor of a power station having a maximum power of 25MW, connected load of 50MW and an average demand of 15MW is:

a) 1.667 b) 0.6 c) 0.3 d) 1.33 e) 2 f) 0.5

(1-b) The initial investment value of an equipment with a life time of 25 years is 1 million L.E. and its salvage value is 0.2 million L.E. After ten years, a fire damaged the equipment, where its salvage value was 10000 L.E. The owner purchased a new equipment for 1.1 million L.E. If the owner uses the diminishing-value method of depreciation, find the total additional money that the owner has to pay to purchase the new equipment. (7 mark)

(1-c) A company uses the sliding-scale tariff method, where each kilowatt hour costs 0.1 LE. In addition, the customer has to pay a penalty if the power factor is lower than 0.85. The penalty is defined as 500 LE multiplied by the difference between the critical and the actual power factor. Calculated the total cost of the consumed energy in the following cases: (a) the total consumed energy is 1000 kWh at a power factor of 0.72and (b) the total consumed energy is 1200 kWh at a power factor of 0.82. (7 mark)

(2-a) What is the difference between soft and hard constraints? Give examples of each type and mention the importance of the constraints in the operation of the power system. (7 mark)

(2-b) The input fuel in (Btu/h) for a power plant with min. and max. power of 20 and 100 MW respectively is given by: $F=(50+4*P+0.015*P^2)*10^6$, where P is the generated power in (MW). Plot the input-output curve of the plant. Calculate the heat rate and plot its curve against the output power. Assuming a fuel cost of $0.15*10^{-6}$ \$/Btu, calculate the incremental fuel cost in \$/MWh and plot its curve against the output power. (7 mark)

2-c) Prove that the optimal allocation of any load between the working power plants in a certain network is achieved when the incremental fuel costs of all units are equal. (7 mark)

P.T.O.

(3-a) The incremental fuel costs in \$/MWh for a plant consisting of three units are given by: $\frac{dF_1}{dP_1} = 0.015P_1 + 3.4$, $\frac{dF_2}{dP_2} = 0.018P_2 + 2.6$ and $\frac{dF_3}{dP_3} = 0.01P_3 + 2.8$. Calculate the saving in \$ in the case of a load demand of 800 MW when the optimal dispatch is used compared to distributing the load equally between the three units. The minimum and maximum loads on each unit are respectively 100 and 300 MW. (7 mark)

(3-b) The incremental fuel costs in \$/MWh for 3 generating units are given as: $\frac{dF_1}{dP_1} = 0.009P_1 + 3.5$, $\frac{dF_2}{dP_2} = 0.012P_2 + 3$ and $\frac{dF_3}{dP_3} = 0.008P_3 + 3.6$. The minimum and maximum loads on each unit are respectively 100 and 350 MW and the load demand is 800 MW. The loss formula is given as: $P_{loss} = 0.00014\,P_1^2 + 0.00008\,P_1 \cdot P_2 + 0.00009\,P_2^2 + 0.0001P_3^2 + 0.00012\,P_2 \cdot P_3$, where P is in MW. Find the optimal load allocation among the generators *using only two iterations*. Start with a lagrange multiplier value of 6 and penalty factors of unity. (7 mark)

(4-a) Classify steam power plants with all possible ways and mention the losses in each part showing how can you calculate the efficiency of each part. (7 mark)

(4-b) Mention in details the main parts of the hydroelectric power plants and explain the function of each part. (7 mark)

(4-c) Discuss the advantages and disadvantages of nuclear power plants. (7 mark)

4-d) Discuss the main reasons of using the renewable energy sources as an alternative to the conventional centralized power stations and compare between fuel cells and wind turbine as renewable energy sources. (7 mark)

Good Luck

(Dr. Ahmed Refaat Azmy et al)

20-1-2009

٣ قوى قديم

جامعة طنطا
كلية الهندسة
قسم هندسة القوى الكهربية

امتحان الفرق الرابعة
تنظيم صناعي (لائحة قديمة)

الزمن : ساعتان
2009 /1/20

اجب عن الأسئلة الآتية:-

1- ما هي العوامل (العناصر) الرئيسية التى تؤثر على تكلفة الانتاج وتكلفة الاستثمار؟

2- تكلم عن نقطة التعادل بالنسبة للمشروع الصناعى وأهمية تحديدها؟

2- تعتمد الحسابات المالية للمنشآت الصناعية على نظام لتسجيل الايرادات والمصروفات وصولا الى الميزانية العمومية للمنشأة ، ما هى الخطوات الواجب اتباعها فى عمليات التسجيل وصولا الى بيان الميزانية العمومية ومكوناتها الرئيسية؟

3- تكلم عن مكونات عناصر الانتاج فى المشروعات الصناعية وكيف يمكن حمايتها من المخاطر ومن الحوادث؟

4- هناك عناصر اساسية ، وعناصر ضرورية ، وعناصر لازمة (هامة) تدخل جميعها فى عمليات التصنيع، ما هى مكونات تلك العناصر الثلاث.

5- يوضح الجدول التالى حركة المخزون للمواد التى تدخل فى عمليات التشغيل فى مشروع صناعى:-

التاريخ	سعر الشراء$/ طن	المواد الداخلة بالطن	الرصيد بالطن
2008/2/5	120	10000	10000
2008/4/12	130	12000	22000
2008/7/16	145	8000	30000
2008/10/12	150	5000	35000

احسب تكلفة التكلفة التقديرية لعدد 32000 طن من المواد باستخدام الطرق الثلاث لتقدير تكلفة المواد المستخدمة فى عمليات التشغيل.

٣ ق ك كهربية ندعم
مقرر اختيارى خارج التخصص (١)
مرحلة قوى ميكانيكية

Tanta University
Faculty of Engineering
Elec. Power and Machines Eng. Dept.
Third Year (old curriculum) 1997
Subject: Elective Course (1) ME3108
(Mechanical power stations)

Date: 15/1/2009
Final exam (Jan. 2009)
Time allowed 3 hours
Full Mark: 85 Marks

Close book exam. All questions must be answered. Draw schematic whenever applicable, and clearly state your assumptions. You can use steam tables and charts

يسمح للطالب باستخدام جداول وخرائط البخار

Question (1) (20 marks)

The steam entering the turbine in a steam power station is at a pressure of 54 bar and temperature 520 °C, while the condenser pressure is 0.08 bar. The steam is bled at the pressures 18 bar and 4 bar. The feed water heaters are of closed type where the feed water is heated to the temperature of bled steam. The bled steam is condensed to saturated water and returned back to the feed water line after each heater. There is only one pump in the feed line. The power of the plant is 80 MW and the expansion through the turbine is isentropic,

(a)- Sketch the flow diagram of the plant and the corresponding cycle on T-S diagram
(b)-Calculate the quantity of bled steam to each heater for 1 kg steam entering the turbine
(c)- Find the rate of bled steam to each heater Ton/hr
(d)- Calculate the cycle thermal efficiency
(e)- Calculate the specific steam consumption
Neglect the pump work

Question (2) (17 marks)

(A)- Prove that the thermal efficiency of the Diesel cycle is as follow:

$$\eta_D = 1 - \frac{1}{r^{\gamma-1}} \frac{r_c^{\gamma} - 1}{\gamma(r_c - 1)}$$

Where: r = compression ratio
r_c = cut-off ratio

(B)- An air standard Otto cycle has a compression ratio of 8. The pressure and temperature at the beginning of compression are 1 bar and 27 °C respectively. The heat transfer to the air per cycle is 1600 kJ/kg of air. Determine the following:

a)- the pressure and temperature at each corner of the cycle
b)- The thermal efficiency of the cycle
c)- the mean effective pressure of the cycle

Question (3) **(20 marks)**

An open cycle gas turbine plant consists of a compressor, a combustion chamber, a heat exchanger and a turbine. Air is compressed from 1.01 bar and 20 °C to 6.5 bar. Heat is added to increase the temperature to 770 °C. Expansion takes place in the turbine after which the gases pass through the heat exchanger. Pressure drop in the air-side of the heat exchanger together with the pressure drop in the combustion chamber is 0.07 bar and in gas side of the heat exchanger is 0.05 bar. If the effectiveness of the regenerator is 0.6 and the gases leave it at a pressure of 1.05 bar. Calculate the specific output and the plant efficiency. The process in the compressor and the turbine may be assumed as isentropic.

Question (4) **(16 marks)**

(A)- In a test of a water cooled compressor, it was found that the shaft work required to drive the compressor is 176.6 kJ/kg of air delivered, and that the enthalpy of the air leaving is 71.2 kJ/kg grater than that of entering. If the increase in the enthalpy of the circulating water is 96.3-kJ/kg air, compute the amount of heat transferred to the atmosphere from the compressor per kg of air.

(B)-An insulated rigid vessel contains some fuel and air at a pressure of 10 bar and a temperature of 25 °C. The fuel is ignited, causing a pressure and temperature rise of contents of the vessel. The final temperature is 540 °C. Taking the vessel and contents to be the system under consideration:

i- Evaluate the increase in the internal energy of the system.

ii- If the insulation is removed, and the heat transfer of 50 kJ from the system causes the temperature to fall to the initial value 25 °C, determine the increase in the internal energy of the system during this process

Question (5) **(12 marks)**

(A)- In a reversed heat engine, the work done is 76 kJ, and the transfer to the engine from a low temperature heat reservoir is 204 kJ. Determine the amount of heat transferred from the engine to the surroundings, and the coefficient of performance of this engine when works as a refrigerator

(B)- A person claims to have designed an engine that receives 52.5 kJ of heat and produces 13 kJ of useful work, when operating between a source temperature of 60 °C and a sink temperature of 0 °C. Is this claim valid?

All the best

Dr. Y. EL-Samadony