Tanta University
Faculty of Engineering
Mechanical Power Eng. Dept.
Fourth Year

Semester Final Exam
Elective Course(2)– Fuel Systems
January 12, 2011 - Time: 3 hours
Full Mark: [60]

Answer the following questions. Assume any necessary assumptions. Mark

1. a) Define each of the following: [12]
   i) Burner port loading, ii) Combustion intensity,
   iii) Wobbe index, iv) Coal grade.
   b) Explain briefly hydrocarbon molecular structure groups..
   c) Discuss briefly analysis and testing of solid fuels.

2. Discuss briefly each of the following items: [9]
   a) Characterization of liquid fuels.
   b) Gasoline specifications.
   c) Alternative liquid hydrocarbon fuels.

3. Explain each of the following: [12]
   a) Types of gaseous fuel burners.
   b) Spray characteristics and their importance in liquid fuel combustion process.
   c) Types of stoker fired boilers.

4. Using simple illustrations, explain each of the following: [9]
   a) Liquid fuel-oil supply and distribution system.
   b) Stability diagram for single-port gaseous fuel burner of a premixed flame.
   c) Types of Diesel engine fuel injection nozzles.

5. Describe briefly each of the following: [8]
   a) Advantages of suspension burning over fixed bed combustion systems.
   b) Types of fluidized bed combustion systems.

6. Suppose that a power plant operates at an average annual load (متوسط حمل سنوي) of 100 MW and the overall thermal efficiency 30%. If the plant operates 7500 hours/year and uses natural gas with net calorific value = 35 MJ/m^3, where fuel unit price = 0.5 LE/m^3, (at normal pressure and temperature), estimate the cost of the used fuel per year. [10]

Good luck,

Prof. Dr. S. H. El-Emam

قوى ميكانيكية هدير

Tanta University

Faculty of Engineering

Department of Mech. Power Engineering

Year: Fourth Subject: Hydraulic Machines (A)

Name: Z.M. Omara

Date: -1-2011

Time allowed: 3 Hours

Full Marks : 75

Final Exam: pages 2

Academic Number: MEP41 20

Question 1

(marks 19)

1- a)) Explain, starting the centrifugal pump, pump model and similarity considerations, pump selection and inlet and outlet piping of a centrifugal pumps.

1- b) Draw sectional view of a centrifugal pump giving the name of its main parts? And explain the working mechanism of a centrifugal pump?

1- c) The impeller of a centrifugal pump has back ward at facing blades inclined at 30o to the tangent at impeller outlet. The blades are 20 mm in depth at the outlet, the impeller is 250 mm in diameter and it rotates at 1450 rpm. The flow rate through the pump is 0.028m3/s and a slip factor of 0.77 may be assumed. Determine the theoretical head developed by the impeller, and number of impeller blades.

Question 2

(marks 19)

2- a) What is meant by priming? Explain some of the important methods of priming?

2- b) Discuss the effect of the following parameters on the performance of rotodynamic pumps: a- Pre-whirl inlet velocity. b- Rotational speed.
c- Direction of rotational speed. d- Blade outlet angle.

2- c) Explain how can one derive the performance characteristic curve for a given rotodynamic pump in practice ?

2- d) A centrifugal pump running at 1000 rev/min gave the following relations between head, overall efficiency and discharge:

Q(l/s)	0	5	10	15	20	25	30
Hm	22.5	22.2	21.6	19.5	14.1	10	0
η %	0	26	48	66	78	74	52

The pump is connected to a 300 mm suction and delivery pipe the total length of which is 69 m and the discharge to atmosphere is 15 m above sump level. The entrance loss is equivalent to an additional 6 m of pipe and friction coefficient is assumed as 0.024.

Calculate: 1- The discharge in m3/min. **2**-Overall efficiency 3-Manometric head
4- Shaft power at the operating point

It is required to adjust the flow to one half of its original value by:

1- Regulating the pump speed, estimate that speed.

2- By using a throttle valve:

a- Find out the % shaft power lost in the valve? b- Draw the new system curve.

Question 3 **(marks 19)**

3- a) Explain, effect of number of blades and viscosity on performance curves of centrifugal pumps

3- b) State the difference between a closed, semi-closed and open impeller.

3- c) Draw an accurate section of an axial flow pump indicating the flow direction. What are the functions of upstream and downstream vanes? What is an application for axial pump?

3- d) To predict the performance of a large centrifugal pump, a scale model of one-fifth size was made with the following specifications: P=30KW, H=8m, N=1000 rpm if the prototype pump has to work against a head of 25m. Make calculations for its working speed, the power required to drive it and the ratio of the flow rates handled by the two pumps.

Question 4 **(marks 18)**

4- a) Explain types of stuffing box?

4- b) What do you understand by cavitation? What are its causes and how it can be prevent. Draw the performance curves of a centrifugal pump under cavitation conditions and explain NPSH of a centrifugal pump.

4- c) Cavitation test were performed on a pump giving the following results : Q = 0.05 m^3/s, H = 37 m , barometric pressure 760 mm of mercury, ambient temperature 25 °C, cavitation began when the total head at the pump inlet was 4 m . Calculate the value of thoma cavitation coefficient and NPSH.

What could be the maximum height of this pump above water level if it is to operate at the same point on its characteristic in the ambient condition of the barometric pressure of 640 mm of mercury and temperature of 10 °C?

ميكانيكا قوى (أ)

جامعة طنطا
كلية الهندسة
قسم هندسة القوى الميكانيكية
الفرقة الرابعة (لائحة حديثة) - المادة : دراسات بيئية

التاريخ: ٢٠١١/١/١٧
الزمن : ثلاث ساعات
الدرجة العظمى : ٨٥ درجة
الامتحان النهائي في ورقتين

أجب عن الأسئلة الآتية:

السؤال الأول:

أ- ما المقصود بالتلوث؟ ومن السبب وراءه؟ ثم اذكر مستويات التلوث وما هي الأضرار الناتجة عن التلوث وكيفية علاجها؟

ب- اذكر مصادر تلوث الهواء، ثم اشرح بالتفصيل الجسيمات الدقيقة العالقة ؟

ج- من أضرار تلوث الهواء تشويه البيئة من حولنا اشرح ذلك بالتفصيل.

(١٥ درجة)

السؤال الثاني:

أ- إتباع الطرق الوقائية من الطرق المستخدمة في ضبط التلوث الهوائي والتحكم اشرح ذلك بالتفصيل، ثم وضح كيفية ضبط التلوث الهوائي من وجهة نظرك أنت.

ب- من أجل الحد من تركيز الملوثات في عوادم المصانع يتم تنظيف المداخن بها ، تكلم تفصيليا عن:

١- المرسب الكهربائي الساكن(Electrostatic precipitator).

٢- جهاز ترطيب الغاز و غسله.

ج- أذكر مصادر تلوث المياه، وما هي الأسباب التي تؤدى إلى تلوث المياه بالنفط؟

د- اشرح كلا من المرحلتين التمهيدية والبيولوجية في معالجة مياه الصرف الصحي.

(٢٥ درجة)

السؤال الثالث:

أ- اذكر مصادر تلوث التربة ،ثم اشرح بالتفصيل دور الانجراف في تلوث التربة.

ب- من المصادر الصناعية للتلوث بالإشعاع التطبيقات الطبية، تكلم عنها بالتفصيل؟

ج- ما هي أضرار النفايات الصلبة في المقالب العمومية المكشوفة؟

د- عرف التلوث السمعي، وما هي الآثار المترتبة على الضوضاء؟ وما هي الحلول الفعالة لتجنب إحداث الضوضاء؟

و- عند احتراق كمية من غاز البيوتان (C_4H_{10}) كانت كمية الهواء الفعلي تساوى ٩٠%. احسب النسبة الحجمية لغاز CO الناتج وكذلك كمية الهواء الفعلي المستخدم لحرق ١ كيلوجرام من الوقود

(٢٥ درجة)

السؤال الرابع:

أ- عرف التلوث البصري، واذكر بعض الأمثلة على هذا النوع من التلوث؟

ب- ما هو المبدأ الأساسي لمراقبة البيئة؟ وما هي فوائد مراقبة البيئة ضمن خطة طويلة الأمد؟

ج - ما المقصود بالطاقة القابلة للاسترجاع (المتجددة) والطاقة الغير متجددة، مع ذكر أنواع كلا منها؟ ثم أذكر بعض التطبيقات على استخدام الطاقة الشمسية؟

د- اشرح مع الرسم محطة توليد الطاقة الكهربائية باستخدام الطاقة الشمسية وأذكر مدى مساهمتها في العمل على تقليل التلوث؟

(٢٠ درجة)

مع التمنيات بالنجاح ،،،،، د/عبدالقادر سعد

b) What is the maximum pressure rise if water flowing at 3 m/s is stopped instantaneously? How could you reduce the effect of water hammer? **(2 Marks)**

c) How could you classify the air handling units? **(5 Marks)**

Problem number (4) (18 Marks)

a) Mention in details the main components of an air handling unit. **(8 Marks)**

b) The sensible and latent heat gain of a hall is 24 kW and 6 kW, respectively. The hall is to be maintained at 26°C db and 50% RH. A rate of 1 m^3/s of outdoor air at 40°C db and 25°C wb is to be mixed with 1 m^3/s of return air. Part of the air mixture is passed through a cooling coil and the rest is by-passed beyond the cooling coil. Assuming that air leaves the cooling coil at 90% RH. Find the capacity of the cooling coil in TR. **(10 Marks)**

,,,,,,With the best wishes,,,,,,

Course Examination Committee:

Dr. Eng. Mohamed Mahgoub Bassuni

Tanta University

Department: Mechanical Power Engineering
Total Marks: 85 Marks

Faculty of Engineering

Course Title: Advanced Ref. and Air Conditioning | Course Code: MEP4127 | Year: 4th
Date: Jan. 26th 2011 (first term) | Allowed time: 3 hrs | No. of Pages: (2)

Remarks: (Answer the following questions, assume any missing data, answers may be supported by sketches), Tables of ref. and air conditioning and tables of ref. equipment and design data are ONLY allowed (available with students).

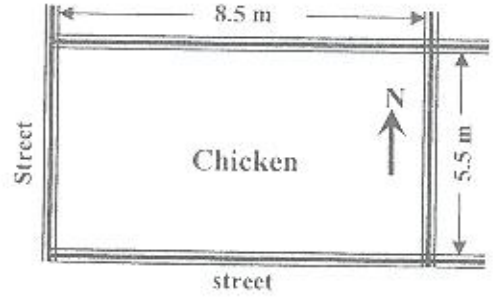
Problem number (1) (35 Marks)

a) Define the cold store and mention their types and the main considerable points when starting to design a one. **(5 Marks)**

b) The shown figure is a plan of a single floor of a house at **Tanta**. It is required to design cold store room of 8.5 m×5.5 m×5 m to store **chicken**. Perform a complete detailed design for the room, provided with a layout of the unit using R-22 as a refrigerant. The following items should be taken into considerations:

- Type of storing is long.
- Storing rate is 10 %
- The room is used 10 months per year
- Cork bard can be used as insulation material. The cubic meter of this insulation costs 300 L.E. for buying + 150 L.E. for fixing. Its supposed age can be considered as 20 years.
- There are three workers.

(30 Marks)



Problem number (2) (17 Marks)

a) Describe in details each component of the most popular method in ice manufacture. **(7 Marks)**

b) Mention why we use the defrost systems, and how it can be controlled? **(3 Marks)**

c) What is the hybrid desiccant air conditioning system? Comparing between it and a vapour compression system with terminal reheat (using psychrometric chart). **(7 Marks)**

Problem number (3) (15 Marks)

a) What are the fundamental components of a closed hydronic system? Show with sketches two different types of hydronic system layout and sketch the pressure drop diagram of each type. **(8 Marks)**

P.T.O.