TANTA UNIVERSITY
FACULTY OF ENGINEERING
DEPARTMENT OF MECHANICAL POWER ENGINEERING
SECOND YEAR STUDENTS OF PRODUCTION ENGINEERING & MACHINE DESIGN
COURSE TITLE: HEAT TRANSFER COURSE CODE: MEP2251

DATE:JUNE, 2014 SECOND TERM TOTAL ASSESSMENT MARKS: 75 TIME ALLOWED : 3 HOURS

Remarks: (answer the following questions; assume any missing data, steam and heat tables and charts are allowed)

Problem number (1) (15 Marks)

a) Will the thermal contact resistance be greater for smooth or rough surfaces? (3 Marks)

b) Calculate the critical radius of insulation for asbestos (k = 0.17 W/m. °C) surrounding a pipe and exposed to room air at 20 °C with (h = 3W/m² . °C), calculate also the heat loss per unit length from a 200 °C, 5 cm diameter pipe when covered with critical radius of insulation and without insulation. (12 Marks)

Problem number (2) (15 Marks)

a) What is a conduction shape factor? How is it related to the thermal resistance? (5 Marks)

b) A furnace of 60 by 90 by 120 cm outside dimensions is constructed from a material having a thermal conductivity of 0.865 W/m.°C. The wall thickness is 15 cm. The inner and the outer surface temperatures are 520 °C and 20 °C, respectively. Calculate the total heat loss through the furnace walls. (10 Marks)

Problem number (3) (15 Marks)

a) Explain how the fins enhance heat transfer from a surface. Also, explain how the addition of fins may actually decrease heat transfer from a surface. (6 Marks)

b) A long and thin copper rod of 6.4 mm diameter (k = 372 W/m.°C) is exposed to an environment at 20 °C. The base temperature of the rod is 150 °C. The heat transfer coefficient between the rod and environment is h = 15 W/m².°C. Determine (1) the heat given up by the rod (2) fin effectiveness (3) fin efficiency. (9 Marks)

Problem number (4) (15 Marks)

a) In what medium is the lumped system analysis more likely to be applicable: in water or in air? Why? (5 Marks)

b) A thermocouple junction, which may be approximated as a sphere, is to be used for temperature measurements in a gas stream. The convection coefficient between the junction and the gas is known to be h = 10 W/m² . K, and the junction thermophysical properties are ρ = 8500 kg/m³, k = 400 W/m . K, and c = 400 J/kg . k. determine the junction diameter needed for the thermocouple to have a time constant of 1 s. if the

junction is at 25 °C and is placed in a gas stream that is at 200 °C, how long will it take for the junction to reach 199 °C? (10 Marks)

Problem number (5) (15 Marks)

a) Define the reradiating surface, radiation shields, black body, and irradiation. (4 Marks)

b) A fluid flows through a long tube of 20 mm diameter and the outer surface of which is diffuse and gray with ε_1=0.02 and T_1=77 K. This tube is concentric with a large tube of 50 mm diameter and the inner surface of which is diffuse and gray with ε_2=0.05 and T_2=300 K. The space between the two surfaces is evacuated. Calculate the heat gain by the fluid per unit length of tube. If a thin radiation shield of 35 mm diameter and ε_3=0.02 (for both sides) is inserted midway between the inner and outer surfaces, calculate the change in the heat gain per unit length of the tubes (as a percent ratio). (11Marks)

With my best wishes

EXAMINER DR. ELSAYED ELSAID

Electrical Power and Machines Engineering Department

TANTA UNIVERSITY **Faculty Of Engineering**

Final EXAM 2013/2014 - Second Term

Course	Electrical Machines (EPM2244)	Time Allowed	3 hours
Students	2nd Year (Production Engineering and Mechanical Design)	Total Mark	85
Date	12 / 6 / 2014	Number of pages	1

Answer ALL the following questions:

The first question (25 marks)	
a	Draw the power flow diagrams for d.c generator and d.c motor.
b	Explain the load characteristic of D.C compound generator.
c	Explain the characteristic of d.c shunt motor.
d	Write the various methods used for starting of three-phase induction motor.
e	Draw the phasor diagram of three-phase synchronous generator at lag power factor, lead power factor and unity power factor.
The second question (20 marks)	
a	A 4 pole, lap wound 750 r.p.m. d.c. shunt generator has an armature resistance of 0.4 ohm and field resistance of 200 ohm. The armature has 720 conductors and the flux per pole is 30 mWb. If the load resistance is 15 ohm, determine the terminal voltage
b	A DC series motor has the following data: Armature resistance = 1.5 ohm, series field resistance = 2.5 ohm, supply voltage = 300 Volt, mechanical losses =300 W, if the input power is 6 KW at 3000 R.P.M, find the motor's efficiency.
The third question (20 marks)	
A 5KVA, 500/250 V, 50 Hz, single-phase transformer gave the following readings, Open circuit test : 500 V, 1 A, 50 W (L.V. side open) Short circuit test : 25 V, 10 A, 60 W (L.V. side shorted) Determine a- The efficiency on full load, 0.8 lagging power factor. b- The voltage regulation on full load, 0.8 leading power factor. c- The efficiency on 60% full load, 0.8 leading power factor. d- Draw the equivalent circuit referred to primary and insert all the values in it.	
The fourth question (20 marks)	
A 480 V three-phase induction motor is drawing 60 A line current at 0.85 power factor lagging. The stator copper losses are 2000 W, the core losses are 1800 W, the rotor copper losses are 700 W and the friction and windage losses are 600 W. draw a power flow diagram indicating the following quantities: a- The air gap power b- The developed (converted) power c- The output power (shaft power) d- The efficiency of the motor e- The slip	

Good Luck and best wishes
Dr. Abd El-Wahab Hassan

جامعة طنطا
كلية الهندسة
قسم هندسة الإنتاج والتصميم الميكانيكي

المادة / وصل المواد (MPD2211)
الفرقة الثانية(إنتاج)

بسم الله الرحمن الرحيم
التاريخ : ١٥ /٦/ ٢٠١٤
الزمن : ٣ ساعات

أجب عن الأسئلة الآتية:- (٧٥ درجة)

السؤال الأول:- (١٥ درجة)

١- مما يتكون سيخ اللحام (الالكترود) مع شرح لأهم فوائد مساعدات الصهر المستخدمة فى اللحام.
٢- لماذا يعتبر وجود كبريتيد الهيدروجين ضار فى الاستلين إذا استخدم الغاز في اللحام.
٣- أذكر مع الرسم أشكال الوصلات الملحومة ورموزها.

السؤال الثانى:- (١٥ درجة)

١- تكلم بالتفصيل عن مميزات وعيوب القطع الحراري.
٢- تكلم عن أهم العدد والأدوات المستخدمة في اللحام تحت سطح الماء.
٣- تكلم عن أهم العوامل المؤثرة على جودة اللحام.

السؤال الثالث:- (٢٠ درجة)

١- تكلم عن اللحام بالشعاع الاكترونى مع الرسم.
٢- تكلم بالتفصيل عن اللحام بالاحتكاك مع التوضيح بالرسم لكل نوع.
٣- اذكر أهم مميزات وعيوب اللحام بالقوس الكهربي (مع الرسم).
٤- اشرح الية انتقال المعدن من الالكترود الى الوصلة.

السؤال الرابع:- (٢٥ درجة)

١- أذكر مزايا الاختبارات الغير متلفة- مع ذكر أهم العيوب التى يمكن معرفتها بالاختبارات غير المتلفة.
٢- احسب ثمن التيار الكهربي اللازم للحام خط طوله ٧٢٥ مم وسرعة الانجاز ٦متر/ساعة وشدة التيار ٢١٠ أمبير وجهد ٤٦ فولت والفقد فى التيار ٤٨% وسعر الكيلووات ساعة ٤٩ قرشا ومعامل الجودة ٧٥%.

٣- احسب تكلفة عملية اللحام اللازمة لصناعة غلاية اسطوانية ذات قطر ١ متر وارتفاع ٢.٥ متر. ونهايتها مغلقتين بلوحين دائريين وسيتم لحام الجزء الاسطوانى من الداخل والخارج. علما بأن:-

سمك الألواح = ١٥مم
سرعة اللحام = ٢ م /ساعة(للحام من الداخل) & ٢.٥ م /ساعة (للحام من الخارج)
معدل استهلاك القدرة = ٤ كيلووات ساعة / متر لحام
معدل تكلفة اللحام الفعلى = ٤٠ جنيها / ساعة
تكلفة الاشراف والفحص = ٢٠٠% من التكلفة الكلية.
وقت الاعداد للوصلة = ٦ % من زمن اللحام.

معدل استهلاك الالكترود = ١.٥ م /متر لحام
تكلفة القدرة= ٣ جنيهات /كيلووات ساعة
الهالك من الالكترود = ٥%
تكلفة الالكترود = ٦٠ قرشا /متر لحام.

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

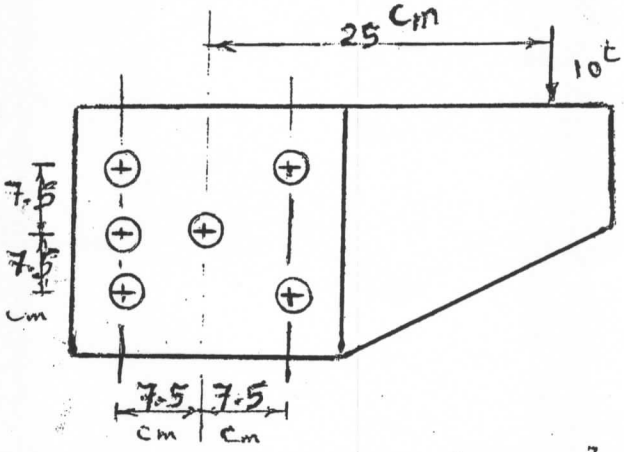
Time: 3 hours
June 2014

بسم الله الرحمن الرحيم
Machines Design

Tanta University
Engineering Faculty
2nd year Prod. Dep.

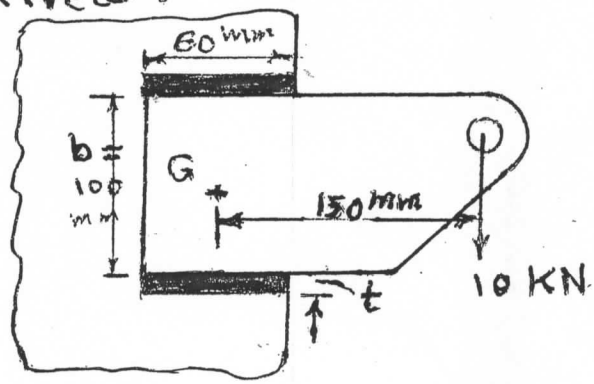
Attempt all quesionts: -

(1) - A bracket is riveted to a column by rivets of equal size as shown in figure. It carries a load of 10 tons at a distance of 25 Cm from the centre of the column. If the max. shear stress in the rivet is limited to 630 Kg/Cm^2, find the diameter of the rivets.

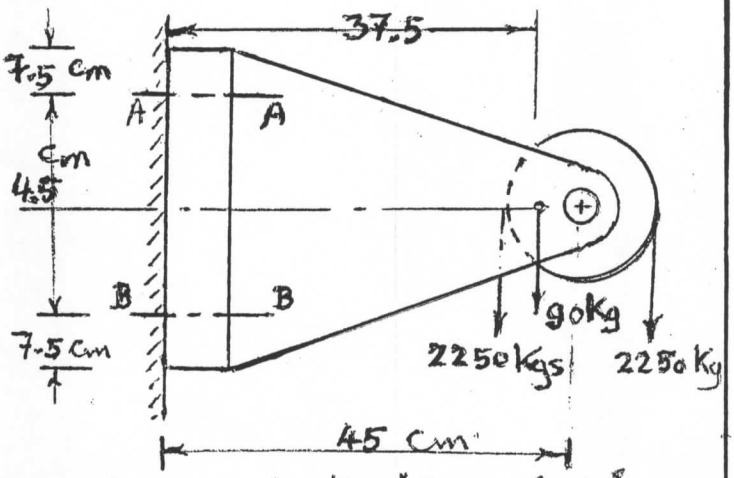


(2) - A bracket as shown in figure carries a load of 10 KN. Find the size of the weld if the allowable shear stress is not exceed 80 N/mm^2.

$$I_G = t\ell(3b^2 + \ell^2)/6$$



(3) - A pulley bracket as shown in figure is supported by 4 bolts, two at A-A and two at B-B. Find the size of bolts using an allowable shear stress of 250 Kgs/Cm^2 for the material of bolts.



(4) - A Leather belt 9 mm x 250 mm is used to drive a Cast Iron pulley 90 Cm in diameter at 336 r.p.m. if the active arc on the smaller pulley is 120° and the stress in the tight side is 20 Kgs/Cm^2, find the hourse power capacity of the belt which weights 0.00098 Kgs/Cm^3. Coefficient of friction $\mu = 0.35$.

Good Luck ----- Dr. Hanafy Hendawy

Tanta University | Date: 2013/2014

Faculty of Engineering | Time allowed: 3 hrs

Department of Mechanical Engineering | Full Mark: 60 Marks

Year: 2nd year Mechanical production | Subject: Final Exam.

Final Exam: 3 Pages | Name: metrology

Academic Number:

(10 Marks)

1st question

a- What is Metrology?
b- Why is Metrology important?
c- Define : Error, Calibration, Uncertainty, Accuracy, traceability, & ranges.
d- Which of the following is NOT a recommended source to obtain requirements to calibrate test equipment?

- **Manufacture's manuals**
- **Automated calibration software**
- **ISO 17025**
- **Prior experience on similar test equipment**
- **Calibration procedures**

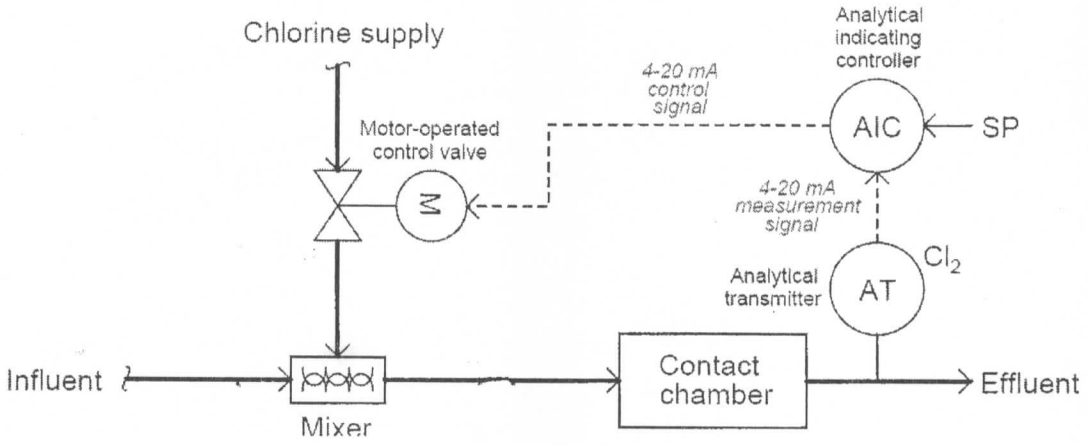
(10 marks)

2nd question

Discuss briefly the wastewater disinfection in the following figure using the included tables:

Transmitter signal current	Chlorine concentration
4 mA	0% (no chlorine)
6 mA	25%
10 mA	50%
15 mA	75%
20 mA	100% (Full concentration)

Controller output signal current	Control valve position
5 mA	0% open (Fully shut)
10 mA	25% open
12 mA	50% open
17 mA	75% open
20 mA	100% (Fully open)



(15 marks)

3rd question

a- What are the different types of instrumentation documents? Discuss briefly indicating the difference try to use simple drawing to indicate your discussion.

b- Explain the following:

- **Calibration intervals.**
- **ISO 17025.**
- **Factors that affecting calibration intervals.**
- **How to establish calibration intervals.**
- **Importance of calibration.**

(15 Marks)

4th Question

a- Defined Criteria for Laboratory Accreditation Metrology Laboratory.
b- How to calibrate the following measurement devices:

- Thermometers .

- Pressure gauges.

- Multimeter.

- Flask of 200 ml.

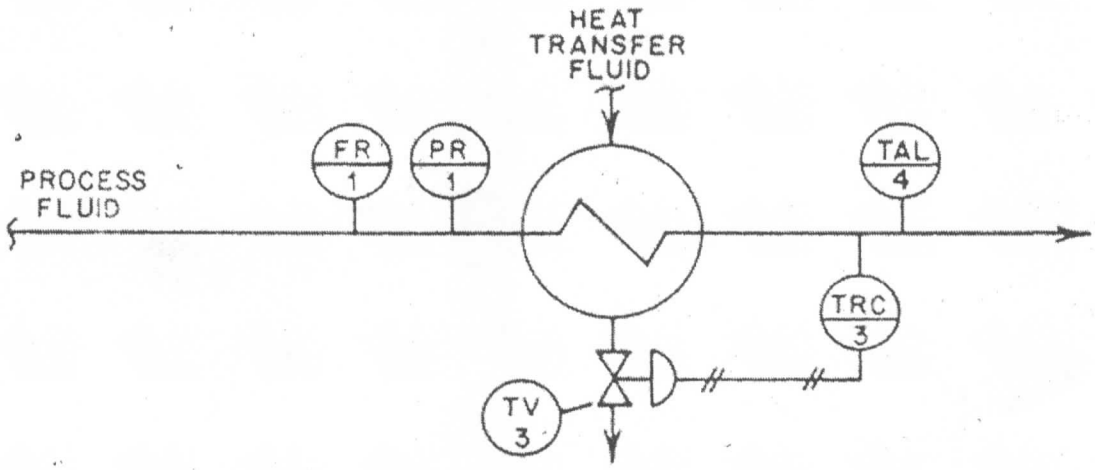
c- What is comparators? Mention some comparators, select two types and discuss advantages and disadvantages including example and the main components for each

(10 Marks)

5th Question

a- What the main component of the following measuring devices; explain that including simplified sketch for each: vernier caliber (type C), Micrometer, Verhier depth gauge, High gauge, and dial gauge.

b- The following figure is a simplified symbolism to show that a gas is heated and temperature controlled by a board mounted controller. The heating fluid is modulated by some type of control valve. The type of control signal is not specified. *Records of gas, flow, pressure, and outlet temperature, and a low* temperature alarm are required on the instrument board. Explain and discuss the system



Tanta University

Department: Prod. Engineering and Mech. Design
Total Marks: 75 Marks

Faculty of Engineering

Course Title: **Furnaces &Heat Treatments**	Course Code: **MDP2213**	Year: **2nd Prod Eng Dept**
Date: **26 - 06 - 2014**	Allowed time: **3 Hrs**	No. of Pages: **(1)**

Answer All The Following Questions With Detailed Drawing As You Can :-

[Note: Every Question carries 5 Marks]

Question (1):- (15 Marks)

(a) Define the heat treatment? what are the important principles of heat treatment?, and What are the defects of heat treatments?.

(b) Define the following terms:-

Phase diagram – Heating – Heatment – Hardening – Hardment – Hardness – Hardenability – Annealing – Normalizing – Tempering.

(c) What are the objectives of heat treatment process? Explain various heat treatment processes in brief?.

Question (2):- (15 Marks)

(a) What the differences of equilibrium phase diagram and iron-carbon diagram? and What are the components on the iron-carbon diagram and their characteristics?.

(b) List the three major parameters which are considered for classification of furnaces? Classify the furnaces based on material charging?.

(c) What do you mean by case hardening? Explain different methods of case hardening in detail?.

Question (3):- (15 Marks)

(a) What does a heat treatment process consist? and What may heat treatment processes be divided into following basic types?.

(b) Draw a neat sketch of $Fe\text{-}Fe_3C$ equilibrium diagram? Explain the microstructural changes that occur on cooling of hypoeutectoid steel from liquid region to room temperature?.

(c) What are the different microstructures of steel? Why the heat treatment of carbon steel is required? Give the elementary idea of various annealing operations.

Question (4):- (15 Marks)

(a) List out different type of heat losses in furnaces? Differentiate between furnace and oven?.

(b) Name at least three additional care to be taken when burners are used for proper distribution of heat in a furnace?.

(c) What are the instruments required for undertaking performance evaluation of the furnace? What are the disadvantages of excess air in a furnace?.

Question (5):- (15 Marks)

(a) What are the various types of annealing? and Where are they used? and What is the major difference in the purpose of annealing and normalizing?.

(b) Define the eutectic alloy? and What are the important characteristics of eutectics? What is the difference eutectic and eutectoid alloys?.

(c) What advantages does an electric heat- treating furnace have over a gas fired heat-treating furnace?.

End of Questions

...(((With My Best Wishes And Good Luck)))...

...[[Examiner: Dr Eng: Alaa A. El-Hammady]]...