السؤال السادس:-

ا- تكلم باختصار عن نظرية عمل الميكرومتر؟ وما هى مزايا استخدام الميكرومتر فى عملية القياس-واشرح كيف تتم قراءة الميكرومتر؟

ب- ١- بين مع الرسم القراءات الاتية بالقدمة ذات الورنية :-

68.32 مم   و   73.65 مم .

٢- بين مع الرسم القراءات الاتية بالميكرومتر:-

23.82 مم   و   19.23 مم .

---انتهت الاسئلة---

((مع اجمل التمنيات بالنجاح))

اجب عن جميع الاسئلة الاتية موضحا اجابتك بالرسم التوضيحى كلما امكنك ذلك.

السؤال الاول:-

ا- عرف علم القياس المترولوجيا؟ وما هى العناصر الاساسية لعلم القياس؟ وبين اهمية علم القياسات، المترولوجية؟

ب- اذكر العوامل المؤثرة فى دقة القياس؟ مبينا ما هو الشرط المطلق للقياس الصحيح؟

السؤال الثانى:-

ا- عرف عملية المعايرة؟ وما هى اهميتها؟ وما الاختبارات الواجب توافرها عند اجراء عملية المعايرة؟

ب- عرف كلا مما يلى :-

الدقة – مدى القياس – الخطية – مدى التدريج – سعة الجهاز – قيمة القياس – التكبير – قيمة البدء

السؤال الثالث:-

ا- بين ما هى العوامل التى تؤثر على اختيار اجهزة القياس؟ (اشرح ثلاثة منها على الاقل؟)

ب- ما هى الشروط الواجب توافرها فى معمل القياس؟و ماذا تحتاج اليه عمليات القياس به؟

السؤال الرابع:-

ا- بين كيف تتم عملية صيانة وضبط قدمات القياس ذات الورنية؟ وما هى اجزاء القدمة ذات الورنية(على الرسم)؟

ب- تكلم و بين كيفية صيانة الميكرومترات؟ وبين اجزاء الميكرومتر (على الرسم)؟

السؤال الخامس:-

ا- قدمة ذات ورنيةمقياسها الرئيسى مقسم الى ملليمترات واخذ ١٩ قسما على المقياس الرئيسى وقسم الى ٢٠ قسم

على المقياس الثانوى- احسب: ١- حساسية الميكرومتر

٢- قيمة كسر الملليمتر فى هذه القراءة

ب- قدمة ذات ورنية مقياسها الرئيسى مقسم الى ملليمترات. حدد عدد اقسام الورنية لكى يمكن استخدام هذه القدمة فى

مقياس:-

١- اى كسر عشرى.

٢- اى كسر منوى.

انظر خلفه-------

Q3: Differentiate briefly between the following (use neat sketches when possible)   (5+4+3+3=**15 marks**)

    a- Iron, iron ore, pig iron, sponge iron, and cast iron.

    b- Steel making in BOF and in arc furnace

    c- Complete and incomplete oxidation of the combustion fuel.

    d- Primary and secondary air in fuel burners.

Q4:   (3+3+14= **20 marks**)

1) List five major objectives of heat treatment.

2) Discuss the interrelationship between the cooling rate, phase transformation, and formation of residual stresses.

3) For the given schematic IT-diagram, where A=austenite, P=pearlite, B= bainite, answer the following:

    a. What are the benifets of IT diagrams

    b. Why austenite exists below the lower transformation temperature on the left of S-curve?

    c. What is the resulting structure for the time lines A →D?

    d. Draw schematically the slowest cooling rate to form 100% martensite.

    e. Draw the cooling pathes for mar-tempering and isothermal tempering and quenching.
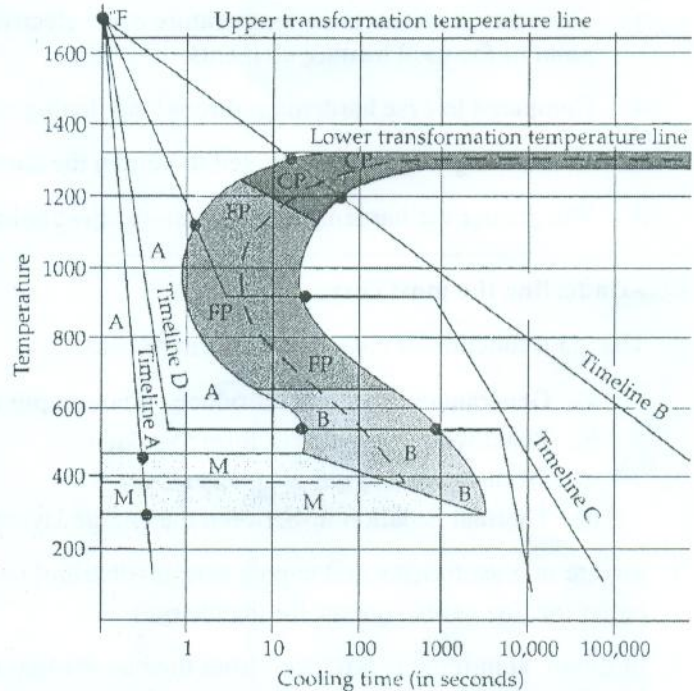
Q5:   (2+3+5= **10 marks**)

1) What is meant by high and shallow hardenable steels? How to achieve each?

2) Explain the different types of surface carburizing methods.

3) Steel balls are required to be case hardened by carburizing to a depth of 1.9 mm.

    a. Given that the diffusion coefficient of carbon, D, was $1.504*10^{-5}$ cm^2/s at 800°C calculate the carburizing time in minutes.

    b. How will be the process time influenced if the carburizing temperature is increased to 850°C, which corresponds to $D = 2.31*10^{-5}$ cm^2/s.

Best wishes,
Dr. Eng. Mahmoud Ahmadein

Course Title: Furnaces and Heat Treatment
Course Code: MPD 2213
Date: 26 Jun 2011 (2nd term, final exam)
Year: 2nd – Production Engineering and Mechanical Design

Total Marks: 75 Marks
Time allowed: 3 hrs
No. of pages: 2

Answer all the following questions. The neat sketches are considered a part of your answer

Q1: State which of the following statements is true (✓) and which is false (✗):   (12 marks)

1. In blast furnace limestone reacts with impurities to form the slag

2. The higher the furnace pressure, the lower the heat losses

3. The maximum operating temperature of an electrical resistance furnace is limited by the melting point of the used heating elements.

4. Compared to case hardening, through hardening produces components with tougher cores.

5. Carburizing is a process utilized to harden the surface layer of medium and high carbon steel.

6. The greater the hardenability, the slower the cooling rate required to form martensite.

Q2: Underline the most correct answer: (18 marks)

1. The main function of coke in blast furnace is to:

    a) Generate the heat and introduce carbon in pig iron.
    b) React with impurities to form the slag.
    c) Produce the flue gases to heat stoves.
    d) Thermal isolation in-between the charge layers.

2. Tuyere in blast furnace and cupola acts as (distribution for furnace charge – passage for burning gases – outlet for flue gases – mixer for the charge).

3. In Egypt, aluminum is produced from the bauxite that is (mined from Aswan – mined from Alwahaat الواحات البحرية – imported – extracted from sea water – mined from Sinai)

4. In heat treatment furnaces, heat is transferred within the load by (convection –conduction –radiation – all)

5. Increasing the momentum of primary air in the confined jet combustion system leads to formation of:

    a) Diffusion flam
    b) Expansion of the jet boundary
    c) External recirculation of exhaust gases
    d) Internal recirculation of exhaust gases.

6. Brine is faster quenchant than water since the soluble salts (provides thicker vapor blanket – increases thermal conductivity of water – explodes causing elimination of vapor blanket – stabilize the water).

7. Final structure of austempered steel is (pearlite – ferrite and graphite – bainite – martensite).

8. Of the problems arising from surface nitriding:

    a) Formation of a dirty appearance surface.
    b) Coarsening due to heating above 500°C
    c) Nitrides are poisonous and require environmental precautions.
    d) Separation of the hardened case from the soft under-layer

9. Hardenability is measured by the (Rockwell scale – Brinell scale – depth of the hardened layer – time of transformation).

Question (4

a) Describe with simple drawings the construction and the principle of operation for induction motor.

b) Draw the speed torque characteristics for 3-phase induction motor and list its advantages.

C) A 3-phase induction motor its wound for 4-poles and is supplied from a 50 Hz system. Calculate (i) synchronous speed
(ii) speed of rotor when slip is 4%

Good luck

Answer all the following questions

Question (1)

a) Draw the power stages (diagram) for d.c generator and d.c motor

b) A 30 kw, 300V, d.c shunt generator has armature and field resistances of 0.05 Ω and 100 Ω respectively. Calculate the total power developed by the armature when delivers full output power.

c) A 440 shunt motor has an armature resistance of 0.08 Ω and field resistance of 200 Ω. Determine the back e.m.f when giving an output of 7.46 kw at 85% efficiency.

Question (2)

a) show that the E.M.F equation of the transformer is

$$E_1 = 4.44fN_1\phi_m$$
$$E_2 = 4.44fN_2\phi_m$$

b) A 300 KVA transformer has core losses of 1.5 kw and full load copper loss of 4.5 kw. Calculate its efficiency for 75% and 125% of full load output at unity power factor.

c) A 100 KVA lighting transformer has a full load loss of 3 kw, the losses equally divided between iron and copper. During a day, the transformer operates on full-load for 3 hours, one half load for 4 hours, the output being negligible for the reminder of the day, calculate the all-day efficiency.

Question (3

a- Describe with simple drawings the construction and the principle of operation for synchronous generator (alternator).

b- Draw the phasor diagrams of a loaded alternator for unity and lag power factor.

c- A 500 KVA, 1100V, 50 Hz, Y connected, 3phase alternator has armature resistance /phase of 0.1 Ω and synchronous reactance/phase of 1.5 Ω. Find its voltage regulation for unity power factor.

انظر باقى الأسئلة

b) A long 20 cm diameter cylindrical shaft made of stainless steel 304 comes out of an oven at a uniform temperature of 600 °C. The shaft is then allowed to cool slowly in an environment chamber at 200 °C with an average heat transfer coefficient of h = 80 W/m². °C. Determine the temperature at the center of the shaft 45 min after the start of the cooling process. Also, determine the heat transfer per unit length of the shaft during this time period. The properties of stainless steel304 at room temperature are k = 14.9 W/m. °C, ρ = 7900 kg/m³, and Cp = 477 J/kg. °C and α =3.95 x 10^{-6} m²/s. (10 Marks)

Problem number (5)   **(14 Marks)**

a) Define irradiation and radiosity. (4 Marks)

b) What is a black body? (3 Marks)

c) A mercury-in-class thermometer having ϵ =0.9 hangs in a metal building and indicates a temperature of 20 °C. The walls of the building are poorly 5 °C. The value of h for the thermometer may be taken as 8.3 W/m². °C. Calculate the true air temperature. (7 Marks)

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

Problem number (1)   **(14 Marks)**

a) What are the thermal contact resistance, critical radius of insulation, and fin effectiveness?

(6 Marks)

b) An insulated steam pipe having outside diameter of 3 cm is to be covered with two layers of insulation each having a thickness of 2.5 cm. The average thermal conductivity of one material is 5 times that of the other. Assuming that the inner and outer surface temperatures of composite insulation are fixed, how much will the heat transfer be reduced when the better insulating material is next to the pipe than it is outer layer?   (8 Marks)

Problem number (2)   **(14 Marks)**

a) What are the types of heat exchangers?   (6 Marks)

b) An aluminum rod of 2.5 cm diameter and 15 cm long is protrudes from a wall maintained at 260 °C. The rod is exposed to an environment at 16 °C. The convective heat transfer coefficient is 15 W/m^2.°C. If the thermal conductivity of aluminum is 200 W/m.K. Calculate the heat loss by the rod.   (8 Marks)

Problem number (3)   **(14 Marks)**

a) Define the Grashof number. What is its physical significance?   (4 Marks)

b) What are the heat exchanger effectiveness, and the fouling factor?   (4 Marks)

c) A horizontal pipe 15 cm in diameter and 4 m long is buried in the earth at a depth of 20 cm. The pipe wall temperature is 70 °C, and the earth surface temperature is 5 °C. Assuming that the thermal conductivity of the earth is 0.8 W/m. °C. Calculate heat lost by the pipe.   (6 Marks)

Problem number (4)   **(14 Marks)**

a) What is meant by a lumped capacity? What are the physical assumptions necessary for a lumped-capacity unsteady-state analysis to apply?   (4 Marks)
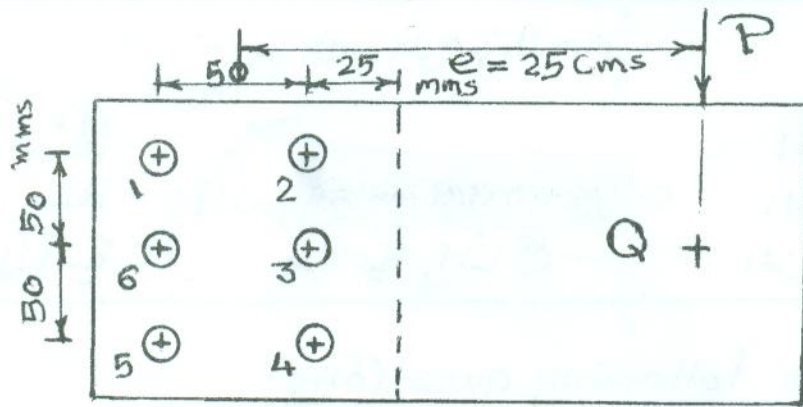
Fig. (2)

Determine the size of the rivets to be used for the joint where the permissble stresses are as follows:

$$\tau_{all.} = 1400 \; Kgs/cm^2 \quad \& \quad \sigma_{all.} = 3400 \; Kgs/cm^2.$$

(4)— A pulley bracket as shown in Fig. (3) 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/cm² for the material of bolts.
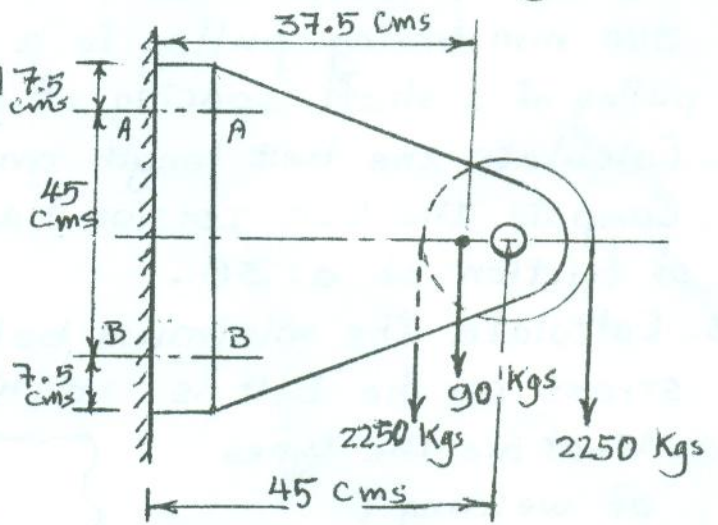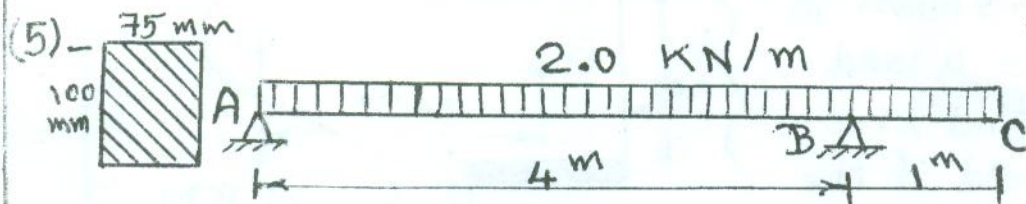

Fig. (3)

(5)—

Fig. (4)

A contenious beam ABC 75 mms width and 100 mms depth as shown in Fig. (4). It carries a uniformly distributed load of 2.0 KN/m. Find the deflection at the free end C. (E = 200 GPa).

راجبت در ده حنا .. ج أي فترة الإجابات التحصيل حتمي ... د. توقيع لدكتور

2/2

بسم الله الرحمن الرحيم

جامعة طنطا
كلية الزراعة
الفرقة الثانية

الفصل الدراسي الثاني C.P/C.11
ميكانيكا وآلات ج

المادة: تصميم ماكينات
الزمن: نونية الـ C.3
الزمن: ٣ ساعات

Answer all the following questions:

(1) - a - State the advantages and disadvantages of belts use.

b - A flat belt has an elastomer envelope is 200 mm wide, and transmits 60 KW at a belt speed of 5 m/s. The belt is used crossed configuration to connect a 300 mm driving pulley to a 900 mm diameter driven pulley at a shaft spacing of 6 m.

1 - Calculate the belt length and the angles of wrap.

2 - Compute the belt tension based on a coefficient of friction of 0.38.

3 - Calculate the minimum belt thick, if the allowable stress on the belt is 16 Kgs/cm².

(2) - a - What are the types of welding?

b - 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/mm².

Fig. (1)

60 mm

b = 100 mm   G+

150 mm

↑ t   10 KN
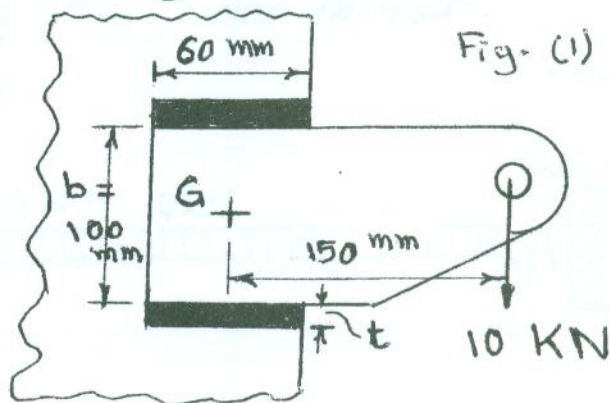
(3) - An eccentrically load lap riveted joint is to be designed for a steel bracket as shown in Fig. (2). The bracket is 10 mms thick. All rivets are to be the same size. The loads on the bracket are P = 1250 Kgs and Q = -1000 Kgs. The rivets spacing is c = 50 mms, load arm e = 25 cms

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أجب عن الأسئلة الآتية:ـ (٧٥ درجة)

السؤال الأول:ـ(١٥درجة)

١ ـ اكتب نبذة مختصرة عن ظروف تعرض الاستلين للانفجار .

٢ ـ لماذا يعتبر وجود كبريتيد الهيدروجين ضار فى الاستلين اذا استخدم الغاز فى اللحام .

٣ ـ أشرح نظرية عمل بورى القطع مع الرسم .

السؤال الثاني (١٥درجة)

١ ـ تكلم بالتفصيل عن مميزات وعيوب القطع الحرارى .

٢ ـ تكلم عن أهم العدد والادوات المستخدمة فى اللحام تحت سطح الماء .

٣ ـ اكتب نبذة مختصرة عن لحام المواد البلاستيكية .

السؤال الثالث:ـ (٣٥درجة)

اكتب نبذة مختصرة عن :ـ (مع الرسم)

ـ اللحام بالشعاع الاكترونى .   (٥درجات)

ـ اللحام باستخدام القوس الكهربائى والغازات الخاملة والكترود التنجستن .   (٥درجات)

ـ اللحام بالقوس الكهربائى المغمور .   (٥درجات)

ـ اللحام بالاحتكاك .   (١٠درجات)

ـ الاختبارات الغير متلفة .   (١٠درجات)

السؤال الرابع:ـ (١٠درجات)

١ ـ اشرح الية انتقال المعدن من الالكترود الى الوصلة .

٢ ـ عند اجراء تجربة على اسطوانة استلين وجد وزنها قبل اللحام ٧٥٠ نيوتن وبعد اللحام ٦٨٠ نيوتن

وسعة الاسطوانة ٥ متر ووزن المتر المكعب ١٤ نيوتن ـ احسب حجم الاستيلين المستهلك فى اللحام .

مع أطيب التمنيات بالنجاح

ا.د/عبد الفتاح مصطفى خورشد