

TANTA UNIVERSITY
FACULTY OF ENGINEERING

DEPARTMENT OF : **Production Engineering & Mech. Design Dep.**

COURSE TITLE: CNC PROGRAMMING

COURSE CODE: MDP 711

DATE: 9-06-2016

TERM: Second term

TOTAL ASSESSMENT MARKS: 70

TIME ALLOWED: 3 HOURS

Notes:

Systematic arrangement of calculations and clear neat drawings are essential.

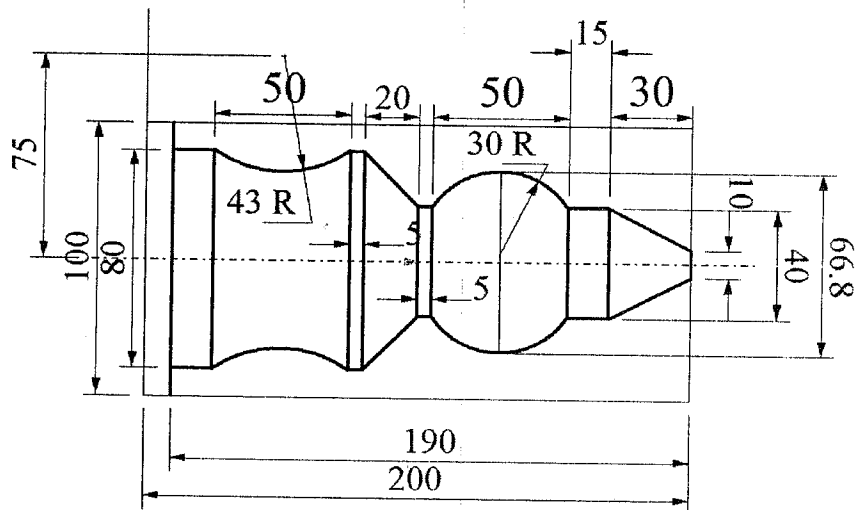
Any data not given is to be assumed – Answer as many questions as you can.

Answer as brief. as possible.

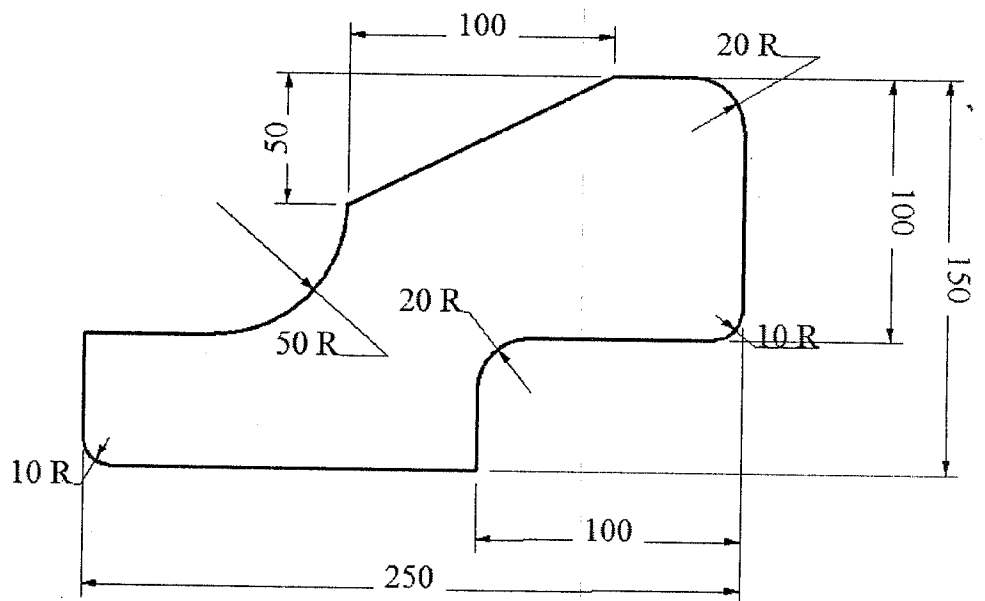
Q1 a) Write down at least 5 advantages and 3 disadvantages for the CNC machine? (5%)

b) With drawing show the axes of different CNC machines? (5%)

Q2 It is required from you to write down the G code to produce the shape shown in the figure below using a CNC lathe machine. Use cutting depth 1mm, finish depth 0.5mm and rotating speed 3000RPM (40%)



Q3 It is required from you to write down the G code to produce the shape shown in the figure below using a CNC milling machine. Use cutting tool diameter 10 mm with rotating speed 3000 RPM. Write only the last contouring bath (40%)



Q4 Draw the G code below with scale

(20%)

G90

G01 Z5.0000

G00 X70.4891 Y40.7002

G01 Z-2.0000

G02 X70.6424 Y57.9951 I-5.8213 J8.6998

G01 X82.6000 Y84.2000

G03 X82.3000 Y12.2000 I-26.3072 J-35.8910

G01 X82.3000 Y12.2000

G01 X70.4891 Y40.7003

G01 Z5.0000

G00 X127.8066 Y33.5549

G01 Z-2.0000

G01 X127.8066 Y6.4858

G01 X96.0928 Y6.4858

G01 X96.0928 Y94.3439

G01 X118.8455 Y94.3439

G01 X135.4982 Y64.6385

G01 X135.4982 Y94.3940

G01 X167.3254 Y94.3940

G01 X167.3254 Y5.6437

G01 X143.2014 Y5.6437

G01 X127.8066 Y33.5549

G01 Z5.0000

G00 X237.5961 Y39.3578

G01 Z-2.0000

G02 X237.7495 Y56.6527 I-5.8213 J8.6997

G01 X237.7495 Y56.6527

G01 X249.7070 Y82.8575

G01 X249.7070 Y82.8575

G03 X249.4070 Y10.8575 I-26.3072 J-35.8910

G01 X249.4070 Y10.8575

G01 X237.5961 Y39.3578

G01 Z5.0000

G00 X287.9318 Y7.1616

G01 Z-5.0000

G01 X287.9318 Y88.2433

G01 X352.3300 Y88.2433

G01 X352.3300 Y67.8896

G01 X322.1892 Y67.8896

G01 X322.1892 Y57.9546

G01 X343.1069 Y57.9546

G01 X343.1069 Y37.4805

G01 X322.2180 Y37.4805

G01 X322.2180 Y27.5250

G01 X352.2695 Y27.5250

G01 X352.2695 Y7.1616

G01 X287.9318 Y7.1616

G01 Z5.0000

G00 X356.6068 Y7.0729

G01 Z-5.0000

G01 X392.2476 Y67.7852

G01 X359.4945 Y67.7852

G01 X359.4945 Y88.3087

G01 X440.2094 Y88.3087

G01 X404.2957 Y27.4099

G01 X438.9069 Y27.4099

G01 X438.9069 Y7.0729

G01 X356.6068 Y7.0729

G01 Z5.0000

G00 X455.9007 Y8.1994

G01 Z-5.0000

G01 X491.5414 Y68.9118

G01 X458.7884 Y68.9118

G01 X458.7884 Y89.4352

G01 X539.5032 Y89.4352

G01 X503.5896 Y28.5365

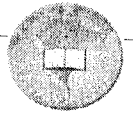
G01 X538.2007 Y28.5365

G01 X538.2007 Y8.1994

G01 X455.9007 Y8.1994

G01 Z5.0000

Good luck E.A.S



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| TANTA UNIVERSITY FACULTY OF ENGINEERING | | | |
| DEPARTMENT OF : Production Engineering & Mech. Design Dep. | | | |
| COURSE TITLE: Design of experimental | | | COURSE CODE: MDP 701 |
| DATE: 5-06-2016 | TERM: Second term | TOTAL ASSESSMENT MARKS: 70 | TIME ALLOWED: 3 HOURS |

Notes:

Systematic arrangement of calculations and clear neat drawings are essential.

Any data not given is to be assumed – Answer as many questions as you can.

Answer as brief. as possible.

Q1 Starting from the equation of the total sum squares, prove that:

$$SS_t = SS_{\text{Treatments}} + SS_E$$

Also explain each term

(10)

Q2 An article in Environment International (Vol. 18, No. 4, 1992) describes an experiment in which the amount of Radon released in showers was investigated. Radon enriched water was used in the experiment and six different orifice diameters were tested in shower heads. The data from the experiment are shown in the following table.

| Orifice Dia. | Radon Released (%) | | | |
|--------------|--------------------|----|----|----|
| 0.37 | 80 | 83 | 83 | 85 |
| 0.51 | 75 | 75 | 79 | 79 |
| 0.71 | 74 | 73 | 76 | 77 |
| 1.02 | 67 | 72 | 74 | 74 |
| 1.40 | 62 | 62 | 67 | 69 |
| 1.99 | 60 | 61 | 64 | 66 |

(a) Does the size of the orifice affect the mean percentage of radon released? Use $\alpha = 0.05$.

(b) Find the P-value for the F statistic in part (a)

(c) Analyze the residuals from this experiment.

(d) Represent the above data in the form of box plot and in a scatter diagram.

(e) Find a 95 percent confidence interval on the mean percent radon released when the orifice diameter is 1.02 and 1.40.

(f) Construct a graphical display to compare the treatment and what conclusions can you draw?

(60)

Good luck E.A.S



Course Title: **Heat Treatment** (MDP 506)
Final Exam of Preliminary Year of
Postgraduate Studies – 05th June 2016

Total Marks: 60
Time allowed: 3 hrs
No. of pages: 2

Answer all the following questions. Neat sketches are appreciated

Q1: Select only one correct answer

(15 marks)

1. (Increasing ductility of – Increasing strength of – Homogenizing – Improving corrosion resistance of) the material is NOT of the objectives of heat treatment.
2. TTT diagram provides information about (cooling rate and composition – cooling rate – composition – temperature – time) required to obtain certain transformation structure of austenite.
3. Brine is faster quenchant than water since the soluble salts (provide thicker vapor blanket – increase thermal conductivity of water – stabilize cooling rate – explode causing elimination of vapor blanket).
4. Hardenability is
 - a) A measure of hardening depth under imposed cooling rate.
 - b) A process of full hardening of a part.
 - c) A process of case hardening of a part.
 - d) The resistance of the material for indentation and scratching
5. The resulting structure after Isothermal tempering and quenching of carbon steel contains (only martensite – tempered martensite & pearlite – tempered martensite & bainite – martensite and tempered bainite – only bainite) and the obtained hardness and tensile strength is (higher – lower – equal to that) obtained from martempering of the same alloy.
6. Nitriding is a case hardening process of (alloy – low carbon – medium carbon – plain carbon) steel. The most common nitriding agent is (nitrogen – sodium carbide – ammonia – sodium cyanide).
7. If the diffusion coefficient of carbon in a steel sleeve is $1.51 \times 10^{-5} \text{ cm}^2/\text{s}$ at the carburizing temperature, the calculated case depth after 15 min is then (1.65 – 0.21 – 1.17 – 0.27) mm.
8. Very long annealing time after cold working leads to (polygonization - growth – recovery – recrystallization – melting) of the distorted solid grains.
9. Strengthening of be ageing basically occurs in alloys with (no – limited – unlimited) solid solubility by forming of (coarse – fine – soft – macroscopic) precipitates of (eutectic – liquid – a coherent – a non-coherent) phase.
10. The best practice أفضل أسلوب for double strengthening an age treatable alloy is:
 - a) Age hardening followed by cold working
 - b) Age hardening followed by grain refinement
 - c) Age hardening followed by precipitation hardening
 - d) Cold working followed by age hardening
 - e) Hot working followed by age hardening
 - f) Age hardening followed by hot working
11. Resistance welding electrodes are normally made of (Stainless steel – Cu-0.5%Cr – Beryllium-bronze – Al-4%Cu – Cu-Brass – Cu-50%Cr – Cu-50%Ni) alloy.

(4+3+6=13 marks)

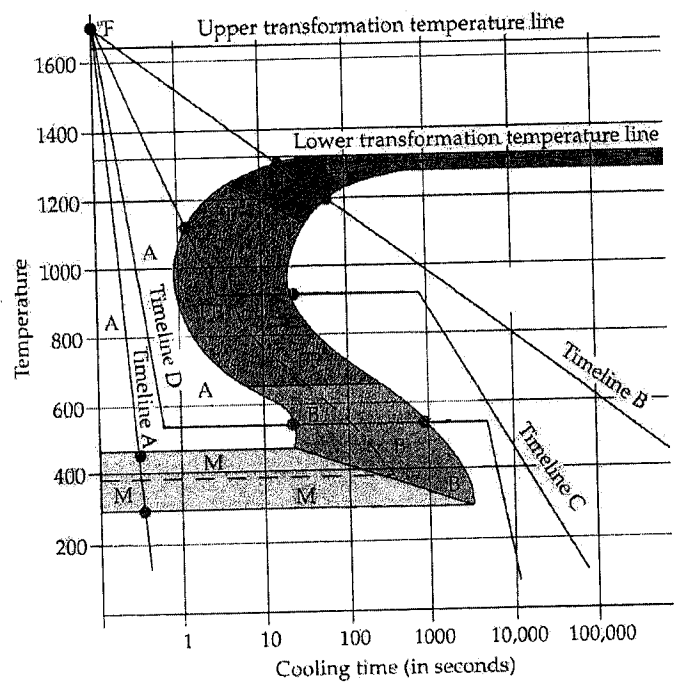
Q2:

- What is meant by high and shallow hardenable steels? How to achieve each?
- Explain shortly the different types of surface carburizing methods.
- With only sketches, differentiate between pearlite, upper bainite, and lower bainite in context of nucleation and growth of their micro-constituents.

(3+3+14= 20 marks)

Q3:

- List five major objectives of heat treatment.
- Discuss the interrelationship between the cooling rate, phase transformation, and formation of residual stresses.
- For the given schematic IT-diagram, where A=austenite, P=pearlite, B= bainite, answer the following:
 - What are the benefits of IT diagrams
 - Why austenite exists below the lower transformation temperature on the left of S-curve?
 - What is the resulting structure for the time lines A \rightarrow D?
 - Draw schematically the slowest cooling rate to form 100% martensite.
 - Draw the cooling paths for mar-tempering and isothermal tempering and quenching.



(2x6 =12 marks)

Q4:

- Residual stresses have to be released from parts subjected to dynamic loads during their service. What are the causes and the consequences of residual stresses and how they could be eliminated by heat treatment?
- List four mechanisms for strengthening nonferrous alloys. Show with help of sketches the procedure of strengthening Al-4%Cu alloy aging heat treatment. Draw the lattice structure of a well-aged alloy.

Best wishes.

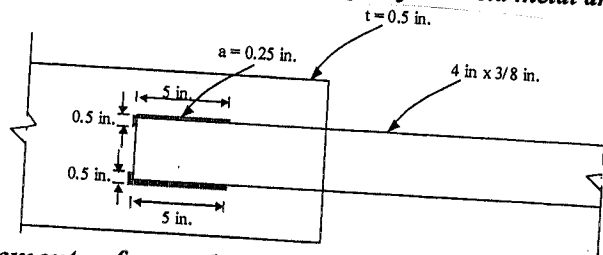
Dr. Eng. Mahmoud Ahmadein

Course Title: Welding Design
Date: 09- 06- 2016Course Code: MDP 511
Allowed time: 3 HrsYear: Post Graduate
No. of Pages: (1)

Answer All The Following Questions (Each Question Carry out Equal Marks)!!!!

Question(1) (12 Marks = 3×4):-

- Explain the conditions for obtaining satisfactory welds, and discuss the importance of welding and state its applications.
- What is the difference between a welding, a weldment, and a weldability?, what factors(give at least four) are taken into account when selecting and designing a joint for a welding application?
- Determine the design strength of the tension member and connection system shown below. The tension member is a 4 in. × 3/8 in. thick rectangular bar. It is welded to a 1/2 in. thick gusset plate using E70XX electrode. Consider the shear strength of the weld metal and the surrounding base metal.



Question(2) (12 Marks = 3×4):-

- What are the common requirements of nontabular and tabular connections? What specific requirements for cyclically loaded nontabular connections?
- What are the design considerations for welding? Why is easier to obtain quality welds in space than in air?
- Two plates 200 mm wide and 10 mm thick are to be welded by means of transverse welds at the end. If the plates are subjected to a load of 70 KN. Find the size of the weld assuming the allowable tensile stress 70 MPa.

Question(3) (12 Marks = 3×4):-

- What are the factors affecting welding load? And give four precautions that can assist in re-heat cracking being avoided in low alloy steels.
- What are the differences between arc welding and gas welding designs?
- A 50 mm diameter solid shaft is to be welded to a flat plate and is required to carry a torque of 1500Nm. If fillet joint is used for welding, what will be the minimum size of the weld when working shear stress is 56 MPa.

Question(4) (12 Marks = 3×4):-

- What are the material properties affect weldability? And what types and features of base metals during design?
- Explain the classification of testing methods? Explain the possible failure mechanism in welded joints and how to design various kinds of welding joints?
- A plate 50 mm wide and 12.5 mm thick is to be welded to another plate by means of parallel fillet welds. The plates are subjected to a load of 50 KN. Find the length of the weld. Assume allowable shear strength to be 56MPa.

Question(5) (12 Marks = 3×4):-

- Why is preheat sometimes required before welding design? What are the three factors that determine the pre-heating temperature for carbon steel during welding design?
- What is a welding procedure specification (WPS)? How is the procedure qualification record (PQR) different from the welding procedure specification (WPS)?
- What are the fundamentals of welding? List the three types of hardness tests on material (briefly explain one)..

The end of questions paper

...(((With My Best Wishes)))... [Dr. Alaa-Eldin A. El-Hammady]...