

UNIVERSITY OF JORDAN
FACULTY OF ENGINEERING
INDUSTRIAL ENGINEERING DEPARTMENT
MIDTERM IN MANUFACTURING PROCESSES
SPRING SEMESTER 2012-2013

Date: 28.03.2013

Instructor: Dr. Yazan Al-Zain

Duration: 1.00 hr

Student No:

Student Name:

Note: Write down your answers in the answers sheet. Make sure to submit the questions' sheets along with any other paper you used in the exam.

[1] Manufacturing is categorized as a:

- [a] Primary industry
- [b] Secondary industry
- [c] Tertiary industry
- [d] Quaternary industry
- [e] Quinary industry
- [f] Senary industry
- [g] Septenary industry

[2] Production capacity is measured in terms of:

- [a] Product quality
- [b] Number of employees
- [c] Machines per unit
- [d] Output units
- [e] Input units
- [f] Employees' qualifications
- [g] Factory's outlay

[3] Metals, Ceramics and Polymers have:

- [a] Similar Physical but different chemical properties
- [b] Similar chemical but different physical properties
- [c] Different chemical and physical properties
- [d] Similar chemical but different mechanical properties
- [e] Similar mechanical but different chemical properties
- [f] Non of the above

[4] Cast Iron is an Iron-Carbon alloy containing:

- [a] 0 to 2 wt.% C
- [b] 0 to 4 wt.% C
- [c] 0 to 3 wt.% C
- [d] 2 to 4 wt.% C
- [e] 4 to 6 wt.% C
- [f] 3 to 6 wt.% C
- [g] 1.5 to 2.9 wt.% C

[5] Steel is an Iron-Carbon alloy containing:

- [a] 0 to 2 wt.% C
- [b] 0 to 4 wt.% C
- [c] 0 to 3 wt.% C
- [d] 2 to 4 wt.% C
- [e] 4 to 6 wt.% C
- [f] 3 to 6 wt.% C
- [g] 1.5 to 2.9 wt.% C

[6] In general, ceramics can't be:

[a] Ductile [b] Strong [c] Brittle [d] Light [e] Heavy [f] Shiny [g] b and f

[7] Various materials have different properties owing to differences in:

[a] Chemical composition [b] Physical properties [c] ~~Atomic structure~~ [d] Melting points
[e] Manufacturing process [f] Magnetic properties [g] Non of the above.

[8] One of the following is not a primary chemical bond:

[a] Hydrogen bond [b] Ionic bond [c] ~~Covalent bond~~ [d] Metallic bond [e] b and c [f] e and c

✓

✗

[9] London forces involve attraction forces between:

[a] Polar molecules [b] Nonpolar molecules [c] Polar and nonpolar molecules [d] Polar molecules and anions [e] Polar molecules and cations [f] Cations and anions [g] Non of the mentioned.

[10] Coordination number for the FCC crystal structure is:

[a] 2 [b] 4 [c] 6 [d] 8 [e] 10 [f] 12 [g] 16



[11] For the BCC crystal structure, the relation between the atomic radius r and the lattice parameter a for the FCC crystal structure is given by:

[a] $a = 2r/\sqrt{2}$ [b] $a = 2r/\sqrt{3}$ [c] $a = 4r/\sqrt{2}$ [d] $a = 4r/\sqrt{3}$ [e] $a = 2r/\sqrt{6}$ [f] $a = 2\sqrt{2}/r$
[g] $a = r/\sqrt{2}$

$$a^2 + a^2 = r^2$$
$$2a^2 = r^2$$
$$\sqrt{2}a = r$$

[12] In point defects, Interstitialcy is:

[a] An extra atom in the structure [b] A Schottky defect [c] A Frenkel defect [d] An ion-pair vacancy [e] A displaced ion [f] An edge dislocation [g] A missing atom in the structure



[13] Plastic deformation mechanisms are:

[a] Slipping & Shearing [b] Twisting & Shearing [c] Shearing & Folding [d] Twinning & Folding [e] Folding & Slipping [f] Tilting & Folding [g] Slipping & Twinning



[14] One of the following is not a property of polymers:

[a] Low density [b] High thermal conductivity [c] Can be highly elastic [d] can be rigid [e] Can be amorphous [f] Can be crystalline [g] High electrical resistivity



[15] In the flow curve equation, necking begins when:

[a] $\zeta = n$ [b] $\zeta < n$ [c] $\zeta = n+1$ [d] $\zeta = n-1$ [e] $\zeta < n$ [f] $K > n$ [g] $K + n = 1$

[16] In the elastic and perfectly plastic stress-strain diagram:

- [a] $K = n$ & $\gamma = 0$
- [b] $K = n$ & $\gamma = 1$
- [c] $K = \gamma + n + 1$
- [d] $K = \gamma$ & $n = 0$
- [e] $K \neq \gamma$ & $n = 0$
- [f] $K = \gamma$ & $n = 1$
- [g] $K \neq \gamma$ & $n \neq 0$

[17] In compression test, friction at the surface of the specimen in contact with the platens will cause one of the following to the specimen:

- [a] Buckling
- [b] Barreling
- [c] shearing
- [d] tearing
- [e] Barreling and Buckling
- [f] Shearing and Buckling
- [g] Nothing at all if platens were smooth.

[18] In Vickers Hardness testing machine, one of the following is true:

- [a] It has a steel indenter
- [b] It has a diamond indenter
- [c] It has spherical indenter
- [d] It has conical indenter
- [e] The indenter gives different impressions depending on the load
- [f] The indenter gives different impressions depending on the time of loading.

[19] Brinell hardness exhibits a close correlation with TS (MPa) for steels, and the formula is:

- [a] $TB = 31HB$
- [b] $TB = 3.45HB$
- [c] $HB = 3.45TB$
- [d] $HB = 31TB$
- [e] $HB = 345TB$
- [f] $TB = 345HB$
- [g] $HB = TB/4.5$

[20] One of the following is used to stabilize the core against buoyancy force of the molten metal:

- [a] Holes in the core
- [b] A cope
- [c] A drag
- [d] Chaplets
- [e] High strength sand
- [f] Thermosetting resin binder
- [g] Low pouring rates

[21] Low fluidity of the molten metal will lead to one or more of the following defect(s):

- [a] Scabs
- [b] Cold shots
- [c] Cold shuts
- [d] Penetration
- [e] Misruns
- [f] Hot tearing
- [g] Mold crack
- [h] Core shift
- [i] Mold shift
- [j] Microporosity
- [k] Pinholes
- [l] Shrinkage cavities
- [m] Sand wash
- [n] Sand blows

[22] Too high strength of the sand will lead to one or more of the following defect(s):

- [a] Scabs
- [b] Cold shots
- [c] Cold shuts
- [d] Penetration
- [e] Misruns
- [f] Hot tearing
- [g] Mold crack
- [h] Core shift
- [i] Mold shift
- [j] Microporosity
- [k] Pinholes
- [l] Shrinkage cavities
- [m] Sand wash
- [n] Sand blows

[23] The casting process(es) that produce(s) a casting with the best surface finish is(are):

- [a] Sand casting
- [b] Shell molding
- [c] Plaster-mold casting
- [d] Investment casting
- [e] Die-casting

low

[24] Too high strength of the sand will lead to one or more of the following defect(s):

- [a] Scabs
- [b] Cold shots
- [c] Cold shuts
- [d] Penetration
- [e] Misruns
- [f] Hot tearing
- [g] Mold crack
- [h] Core shift
- [i] Mold shift
- [j] Microporosity
- [k] Pinholes
- [l] Shrinkage cavities
- [m] Sand wash
- [n] Sand blows

$\lambda + e$

[25] Regarding solidification of metals and alloys, one or more of the following is (are) not correct:

[a] Solidification occurs instantly in pure metals as T_m is reached [b] All metal alloys solidify at the temperature range, except for eutectoid alloys [c] Pure metals solidify at a constant temperature [d] A mushy zone forms during solidification in metal alloys [e] Pure metals are easier to cast

[26] Two flat plates, separated by a space of 5 mm, are moving relative to each other at a velocity of 10 m/sec. The space between them is occupied by a fluid of unknown viscosity.

The motion of the plates is resisted by a shear stress of 15 Pa due to the viscosity of the fluid. Assuming that the velocity gradient of the fluid is constant, the coefficient of viscosity of the fluid in N.s/m^2 equals to:

[a] 0.0065 [b] 0.0075 [c] 0.0085 [d] 0.0095 [e] 0.001 [f] 0.0015 [g] 0.002 [h] 0.0025 [i] 0.003

$$\frac{\text{N.s}}{\text{m}^2}$$

[27] In a tensile test on a metal specimen, true strain = 0.1 at a stress = 300 MPa. When the true stress = 350 MPa, the true strain = 0.3. The flow curve parameters n and K (MPa) are:

[a] $n = 0.2$ & $K = 453.2$ [b] $n = 0.23$ & $K = 435.2$ [c] $n = 0.136$ & $K = 404$ MPa [d] $n = 0.176$ & $K = 416.6$
[e] $n = 0.14$ & $K = 416.6$ [f] $n = 0.14$ & $K = 518.9$ [g] $n = 0.23$ & $K = 398.8$ [h] $n = 0.23$ & $K = 472$

[28] A disk-shaped part is to be cast out of steel. The diameter of the disk = 100 mm and its thickness = 5 mm. If $C_m = 4.0 \text{ sec/mm}^2$ in Chvorinov's Rule, how long in seconds will it take the casting to solidify?

[a] 23.54 [b] 27.21 [c] 20.66 [d] 19.21 [e] 43.22 [f] 73.11 [g] 15.58 [h] 47.9 [i] 36.63 [j] 31.92 [k] 105.03

[29] A horizontal true centrifugal casting operation will be used to make copper tubing. The lengths will be 1 m with outside diameter = 20.0 cm, and inside diameter = 10.0 cm. If the rotational speed of the pipe = 800 rev/min, then the G-factor is equal to:

[a] 71.47 [b] 77.23 [c] 62.09 [d] 77.38 [e] 81.53 [f] 69.9 [j] 67.29 [h] 80.13 [i] 75.71 [j] 68.33 [k] 60

[30] If you were asked to cast an engine for a car, which casting method would you use? Would you need subsequent machining operations? If yes, state why. Try to be as precise and discrete as possible.