



ANSWER ONLY FOUR QUESTIONS

Q1/

- a) List the disadvantages of milling operation? [6D]
b) Match list (I) with list (II) and select the correct answer? [19D]

[1] **List I**

List II

	Type of chip		Type of material being machined and the cutting conditions of the operation
1	Continuous chip	A	Titanium alloys machined at higher cutting speeds
2	Discontinuous chip	B	Ductile materials at low-to-medium cutting speeds
3	Continuous chip with built-up edges	C	Ductile work materials are cut at high speeds and relatively small feeds and depths
4	Serrated chips	D	Cast irons are machined at low cutting speeds

[2]

	Roller Form		Final Rolled Form
1	Bloom	A	Bars, Rods.
2	Slab	B	Plates, Sheets.
3	Billet	C	Structural Shapes, Rails, I-Beam.

[3]

	Forming processes		Temperature Range	Coefficient of friction
1	Cold	A	0.3Tm- 0.5Tm	0.2
2	Warm	B	0.5Tm- 0.75Tm	0.4-0.5
3	Hot	C	≤ 0.3Tm	0.1

[4]

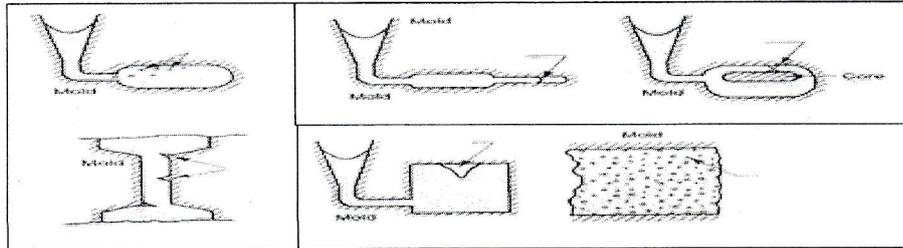
	Solidification Mode		Characteristics
1	The pure metals and alloys, which are (100%) eutectic	A	It has been estimated that in many alloys, rigidity is not establish until the casting is about 60-70% solid.
2	Short freezing range alloys	B	Liquidus-to-solidus interval of 50 to 110 °C
3	Intermediate freezing range	C	The pipe is smooth and geometric in shape, Freezing range approaches zero.
4	Long freezing range alloys	D	Shrinkage when present occurs as internal cavities, which may be of considerable size at the heat centers.
		E	Dispersed shrinkage porosity occurs throughout casting.

[5]

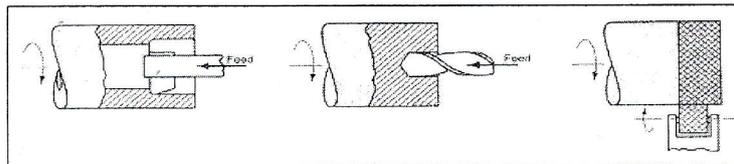
	Casting Process		Limitations
1	Sand	A	Equipment is expensive; part shape limited.
2	Plaster mold	B	Mold cost is high; part size limited; usually limited to nonferrous metals ; long lead time.
3	Centrifugal	C	Some finishing required; somewhat coarse finish; wide tolerances .
4	Die	D	Limited to nonferrous metals; limited size and volume of production; mold making time relatively long.

Q2/ Point to the drawing details illustrated below: [25D]

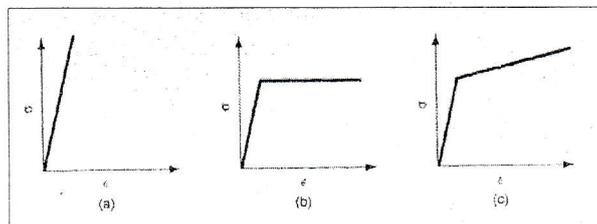
1. Some defects in casting.
2. Machining operations other than turning that are performed on a lathe.
3. Three categories of stress-strain relationship.
4. Hot-chamber die casting.
5. Some common defects in extrusion.
6. Basic bulk deformation processes.



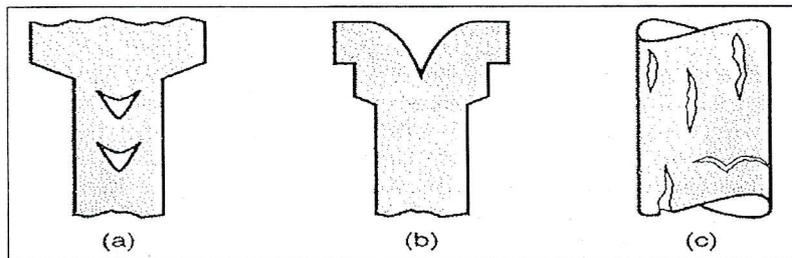
[1]



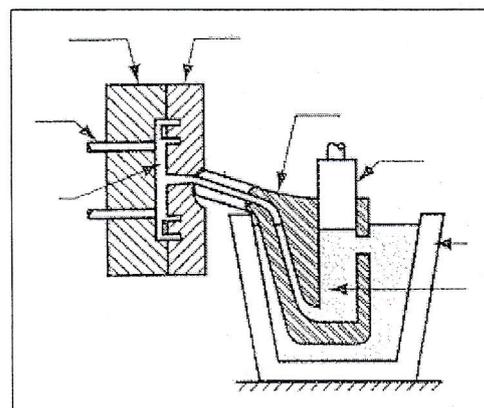
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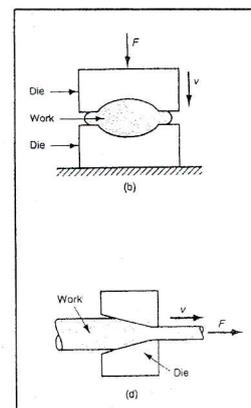
[3]



[4]



[5]



[6]

Q3/

- a) Explain why there might be a change in the density of a forged product as compared to that of the cast blank? [6D]
- b) What is meant by the following terms (five only): (1) Built-up edge (2) Mushy zone (3) Calibration (4) Rolling (5) Cubic boron nitride (cBN) tools (6) Turning? [15D]
- a) How does sheet-metal forming differ from rolling and forging? [4D]

Q4/ Answer all of the multiple choice questions; [25D]

1. The ideal surface roughness in turning operation depends on which of the following parameters (two correct answers); (a) feed (b) speed (c) depth of cut (d) nose radius.
2. Which one of the following cutting tool materials has the highest hardness; (a) HCS (b) HSS (c) Cast cobalt alloys (d) Ceramics.
3. Which one of the following cutting tool materials has the highest toughness; (a) cBN (b) HSS (c) Synthetic diamond (d) Ceramics.
4. Deformation processes include which of the following (two correct answers): (a) casting (b) drilling (c) extrusion (d) forging (e) milling?
5. Which one of the following manufacturing processes will likely result in the worst surface finish: (a) cold rolling, (b) grinding (c) machining (d) sand casting?
6. Which one of the following manufacturing processes will likely result in the best surface finish: (a) arc welding (b) grinding (c) sand casting (e) sawing?
7. Which of the following casting processes are permanent mold operations (three correct answers): (a) centrifugal casting (b) die casting (c) expanded polystyrene process (d) sand casting (e) shell molding (f) slush casting?
8. Which of the following metals would typically be used in die casting (three best answers): (a) aluminum (b) cast iron (c) steel (d) tin (e) tungsten (f) zinc?
9. A lathe is used to perform which one of the following manufacturing operations: (a) casting (b) drilling (c) sawing (d) milling (e) turning?
10. As an alloying ingredient in high speed steel, tungsten serves which of the following functions (two best answers): (a) forms hard carbides to resist abrasion, (b) improves strength and hardness, (c) increases corrosion resistance, (d) increases hot hardness, and (e) increases toughness?
11. Cast cobalt alloys typically contain which of the following main ingredients (three best answers): (a) aluminum, (b) cobalt, (c) chromium, (d) iron, (e) nickel, (f) steel, and (g) tungsten?
12. Which of the following is not a common ingredient in cemented carbide cutting tools (two correct answers): (a) Al_2O_3 (b) Co (c) CrC (d) TiC (e) WC?
13. An increase in cobalt content has which of the following effects on WC-Co cemented carbides (two best answers): (a) decreases hardness, (b) decreases transverse rupture strength, (c) increases hardness, (d) increases toughness, and (e) increases wear resistance?
14. Steel cutting grades of cemented carbide are typically characterized by which of the following ingredients (three correct answers): (a) Co. (b) Fe, (c) Mo, (d) Ni, (e) TiC, and (f) WC?
15. A finishing operation generally involves which one of the following combinations of cutting conditions? (a) high v (speed), f (feed) and d (depth of cut) (b) high v , low f and d (c) low v , high f and d (d) low v , f , and d .
16. Which of the following cutting condition has the strongest effect on cutting temperature; (a) feed (b) speed (c) depth of cut (d) nose radius.

17. Which of the following are the two main functions of a cutting fluid in machining (two best answers); (a) improve surface finish on the workpiece, (b) reduce forces and power, (c) reduce friction at the tool- chip interface, (d) remove heat from the process, and (e) wash away chips?
18. Which of the following manufacturing processes are classified as material removal processes (two correct answers): (a) casting, (b) rolling, (c) forging, (d) grinding, (e) sawing..
19. With which one of the following geometric forms is the drilling operation most closely associated: (a) external cylinder, (b) flat plane, (c) round hole, (d) screw threads, (e) sphere?
20. Which of the basic bulk deformation processes use compression to effect shape change(more than one); (a) extrusion (b) upsetting (c) forging (d) drawing (e) rolling.
21. Which of the following are advantages of hot working relative to cold working (more than one answer)? (a) better surface finish (b) isotropic mechanical properties (c) fracture of workpart less likely (d) lower deformation forces required.
22. Deformation processes include which of the following (two correct answers): (a) casting (b) drilling (c) extrusion (d) forging (e) milling?
23. In shell casting,the volumetric size of the pattern is ----- relative to the casting.(a) bigger.(b) same size.(c) smaller.(d) non of these.
24. Which of the following are advantages of die casting over sand casting (more than one); (a) better surface finish (b) higher melting temperature metals (c) larger parts can be casted (d) mold can be reused.(e) higher production rate.
25. The cutting force in a blanking operation depends on which mechanical property of the sheet metal(a) compressive strength (b) shear strength (c) tensile strength(d) yield strength.

Q5/

- a) Identify three desirable properties of a cutting tool material? [6D]
- b) List and explain specifically example each where friction in metal forming (a) is desirable and (b) is not desirable? Why? [9D]
- c) Correct the wrong sentences if found: [10D]
 - 1) Metal forming applies stresses that exceed the ultimate strength of the metal.
 - 2) In cold forming the strength coefficient $K = \sigma_y$, and strain hardening exponent, $n = 0$.
 - 3) Desirable properties for rolling include high yield strength and low elongation or area reduction.
 - 4) Water, silicon, bismuth, gray and white cast-iron are those materials which expand on freezing.
 - 5) The shear strength of a metal is usually greater than its tensile strength.
 - 6) Wax use to reduce core shifting in sand casting.
 - 7) Aluminum is element added to improve the chip formation and to easier machining properties of steel
 - 8) Drilling, turning, and milling use rotating multiple cutting-edge tools.
 - 9) Knurling is performed on a lathe, but it is a metal forming operation rather than a metal removal operation.
 - 10) Depth of cut, is one of the cutting condition which has the strongest effect on ideal and natural surface roughness.