

**Part A. Answer the following questions (75%)**

1. Manufacturing processes have two basic types: processing operations and assembly operations, tell the difference between these two types. (5%)
2. Materials can be subjected to three types of static stresses, what are they and give brief describe? (5%)
3. Tell the difference between engineering stresses and true stresses. (5%)
4. Describe Rockwell Hardness Test. (5%)
5. Physical properties are defined as the behavior of materials in response to forces other than mechanical. What are these properties? (5%)
6. Two Categories of Casting Process: Expendable mold and Permanent mold processes, explain the two processes in brief. (5%)
7. What is the function of riser in solidification processes? (5%)
8. Heat treatments such as annealing and tempering are used in strengthen and surface hardening of glass. Describe how these two heat treatments processes worked. (5%)
9. What are the three basic steps in the conventional powder metallurgy (PM) shaping? (5%)
10. Progress of polymer melt through barrel leads ultimately to the die zone, before reaching die, the melt passes through a screen pack. Tell the design and functions of screen pack. (5%)
11. What are the two basic types of forging equipment? (5%)
12. How does the ultrasonic machining process work? (5%)
13. What is vulcanization process in elastomer? (5%)
14. In rolling of steel, what are the difference between a bloom, a slab, and a billet? (5%)
15. How does a boring operation differ from a turning operation? (5%)

**Part B. Multiple choice (25%)**

- 1. Which of the following are bulk deformation processes (multiple answers): (a) bending, (b) deep drawing, (c) extrusion, (d) forging, (e) rolling, and (f) shearing?
- 2. A roughing operation generally involves which one of the following combinations of cutting conditions: (a) high  $v$ ,  $f$ , and  $d$ , (b) high  $v$ , low  $f$  and  $d$ , (c) low  $v$ , high  $f$  and  $d$ , or (d) low  $v$ ,  $f$ , and  $d$ . Where  $v$ :cutting speed,  $f$ :feed, and  $d$ :depth.

3. Which of the following manufacturing processes are classified as material removal processes (multiple answers) (a) casting, (b) drawing, (c) extrusion, (d) forging, (e) grinding, (f) machining, (g) molding, (h) spinning?
4. Which of the following casting processes are expendable mold operations (multiple answers) (a) centrifugal casting, (b) die casting, (c) investment casting, (d) shell molding, (e) sand casting?
5. Plain medium carbon steels usually have carbon (a) less than 0.20% C (b) between 0.20% and 0.50% C (c) greater than 0.50% C or (d) no carbon
6. Injection molding is the most widely used molding process for (a) Thermoplastics, (b) Thermosets or, (c) Elastomers, (d) metals.
7. Which one of the following abrasive processed achieves the best surface finish: (a) centerless grinding, (b) honing, (c) lapping, or (d) superfinishing?
8. Which of the following are classified as forging operations (multiple answers): (a) coining, (b) fullering, (c) impact extrusion, (d) roll piercing, (e) swaging, (f) thread rolling, (g) trimming, and (h) upsetting?
9. A lathe is used to perform which one of the following manufacturing operations: (a) broaching, (b) drilling, (c) lapping, (d) milling, or (e) turning?
10. 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, or (e) sphere?
11. Hot working of metals refers to which one of the following temperature regions relative to the melting point of the given metal on an absolute temperature scales: (a) room temperature, (b)  $0.2T_m$ , (c)  $0.4T_m$ , (d)  $0.5T_m$ ?
12. Which one of the four types of chip would be expected in a turning operation conducted at low cutting speed on a brittle work material: (a) continuous, (b) continuous with built-up edge, (c) discontinuous, or (d) serrated?
13. Increasing strain rate tends to have which one of the following effects on flow stress during hot forming of metal: (a) decrease flow stress, (b) has no effect, or (c) increases flow stress?
14. A lathe can be used to perform which of the following machining operations (multiple answers): (a) boring, (b) broaching, (c) drilling, (d) milling, (e) planning, and (f) turning?
15. Of the following cutting conditions, which one has the greatest effect on tool wear: (a) cutting speed, (b) depth of cut, (c) feed?
16. In stress-strain relationship, what kind of material behavior like a perfectly elastic (a) brittle materials (b) ductile materials (c) material processing in high temperature, (d) cold worked materials.

17. Which of the following processes use mechanical energy as the principal energy source (multiple answers): (a) electrochemical grinding, (b) laser beam machining, (c) conventional milling, (d) ultrasonic machining, (e) water jet cutting, and (f) wire EDM?
18. Smaller grain size in grinding wheel tends to (a) degrade surface finish, (b) have no effect on surface finish, or (c) improve surface finish.
19. Which of the following would tend to give higher material removal rates: (a) larger grain size, or (b) smaller grain size?
20. Which of the following will improve surface finish in grinding (multiple answers): (a) denser wheel structure, (b) higher wheel speed, (c) higher work speeds, (d) larger infeed, (e) lower infeed, (f) lower wheel speed, (g) lower workspeed, and (h) more open wheel structure?
21. 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?
22. Which one of the following processes would be appropriate to drill a hole with a square cross section, 0.625 cm side and 2.5 cm deep in a steel workpiece: (a) abrasive jet machining, (b) chemical milling, (c) EDM, (d) laser beam machining, (e) oxyfuel cutting, (f) water jet cutting, or (g) wire EDM?
23. Theoretically, the strength of ceramics should be higher than metals because their (a) electronic bonding, (b) covalent and ionic bonding, or (c) noncrystalline structures bonding, are stronger than metallic.
24. The coefficient of friction between the part and the tool in cold working tends to be (a) higher, (b) lower, or (c) no different relative to its value in hot working?
25. Which one of the following cutting tools cannot be used on a turret lathe: (a) broach, (b) cutoff tool, (c) drill bit, (d) single-point turning tool, or (e) threading tool?