ATMAE

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STUDY GUIDE FOR THE CERTIFIED MANUFACTURING SPECIALIST CERTIFICATION EXAM

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TABLE OF CONTENTS

Content for the ATMAE Manufacturing Specialist Certification Exam 3-5
Sample Questions 6-8
References Used for Developing Exam Questions 9
Recommendations for Taking the ATMAE Manufacturing Specialist Exam 10
Answers to Sample Questions 10

ATMAE Certification Examination General Information 11
- Policy 11
- Examination Information 11
- Individual Examinations 11
- Certification after Examination 11
- Program Assessment 11
- Certificates 11

CONTENT FOR ATMAE MANUFACTURING SPECIALIST CERTIFICATION EXAM

The 16 major content areas from which the exam is comprised are as follows:

	Content	Number of Questions
1.	Manufacturing Joining Processes	10
1.1	Brazing and Soldering	
1.2	Solid State/Resistance Welding	
1.3	Arc/Gas Welding	
1.4	Arc/Gas Cutting	
1.5	Mechanical Fastening	
2.	Manufacturing Forming Processes	10
2.1	Shearing	
2.2	Drawing, Extrusion, and Forging	
2.3	Bending	
2.4	Sheet Metal Classification	
2.5	Sheet Metal Fabrication Nomenclature	
3.	Manufacturing Casting Processes	10
3.1	Casting Nomenclature	
3.2	Expendable-Mold Casting	
3.3	Permanent-Use Casting	
4.	Nontraditional Machining	5
4.1	Chemical	
4.2	Electrical	
4.3	Mechanical	
4.4	Thermal	
5.	Machining	20
5.1	Abrasive	
5.2	Turning	
5.3	Milling	
5.4	Hole Making	
5.5	Thread Manufacturing	
5.6	Gear Manufacturing	
5.7	Miscellaneous Machining Processes	
5.8	Feed, Speed, and Material Removal Rate Calculations	

Content		Number of Questions
6. Manufacturing Philosophies		5
6.1	Lean	
6.2	Theory of Constraints	
6.3	Benchmarking	
6.4	TQM	
7. Polymers		10
7.1	Molecular Composition and Properties	
7.2	Types of Plastics	
7.3	Processing Equipment	
7.4	Chemicals and Additives	
7.5	Mold Pressure Calculations	
8. Industrial Materials		10
8.1	Heat Treatment of Materials	
8.2	Phases of Ferrous Materials	
8.3	Material Classifications and Properties	
8.4	Material Tests	
8.5	Material Strength Terminology	
9. Computer Integrated Manufacturing		10
9.1	G&M Code Terminology	
9.2	CNC and CAD/CAM Nomenclature	
9.3	Types of Manufacturing Systems	
9.4	Robotics	
10. Quality		15
10.1	Control Charts	
10.2	Six Sigma Quality & ISO Standards	
10.3	Statistical Concepts	
10.4	Quality Management	
10.5	Diagrams	
11. Production Planning		10
11.1	Techniques for Process Planning	
11.2	Capacity Planning	
11.3	Master Production Scheduling	
11.4	Inventory Planning and Control	

Content	Number of Questions
12. Wood Technology	10
12.1 Types of Lumber	
12.2 Classification of Lumber	
12.3 Types of Wood Processing Equipment	
12.4 Adhesives	
12.5 Wood Joints	
12.6 Abrasives	
13. Metrology	10
13.1 Standards of Measurement	
13.2 Decimal Equivalency	
13.3 Measuring Instruments and Machines	
13.4 Reading Measuring Instruments	
14. Supervision/Management	20
14.1 Management Concepts and Skills	
14.2 Roles of Managers and Supervisors	
14.3 Functions of Management	
14.4 Communication and Motivation	
14.5 Relationship and Team Building	
14.6 Leadership Styles	
14.7 Appraisal and Discipline	
14.8 Discrimination	
15. Technical Drafting	15
15.1 Multiview Projection	
15.2 Axonometric Projection	
15.3 Oblique Projection	
15.4 Perspective Projection	
15.5 Geometric Dimensioning and Tolerancing	
15.6 Drafting Nomenclature	
15.7 Classification of Fits	
15.8 Sectional Views	
16. Electronics	10
16.1 Electronic Components	
16.2 Electrical Power	
16.3 Electric Motors	
16.4 Circuits, Voltage, Resistance, and Current	

NOTE: Individual content mastery data of examinees can be provided for all of the 82 subsections listed under the 16 major content areas for programs using this exam for assessment purposes.

Sample Questions from Each of the Sections of the Exam

1. When "stick" welding, which welding current produces the deepest penetration?
   a. AC b. DCRP c. DCSP d. none of these

2. Which welding process is limited to ferrous metals?
   a. Gas Tungsten Arc Welding (GTAW)
   b. Gas Metal Arc Welding (GMAW)
   c. Flux Core Arc Welding (FCAW)
   d. Plasma Arc Welding (PAW)

3. Which metal forming process would be used to make solid octagonal bar stock?
   a. plate roll bending
   b. extrusion
   c. progressive roll bending
   d. forging

4. Which casting process has a reusable mold and is used for very high production rates of low melting point allows?
   a. sand b. die c. no-bake d. shell e. investment

5. What allows you to see if a mold is filled with molten metal?
   a. gate b. runner c. riser d. sprue e. flask

6. Which process is sometimes referred to as YAG?
   a. laser b. waterjet c. chemical d. EDM e. photo etching

7. Which NTM process relies on ultraviolet light?
   a. electrochemical b. chemical c. photo etching d. laser

8. What is used to cut threads in a hole?
   a. reamer b. knurl c. tap d. die e. broach

9. What machining process would be used to make a square hole in steel?
   a. reaming b. boring c. knurling d. drilling e. broaching

10. What would be the spindle speed (rpm) for a 1" diameter (8 teeth) side cutter (HSS) cutting mild steel? Recommended cutting speed is 50 sfpm and the feed per tooth is .009"?

Formulas for Machining Problems:

CS = cutting speed in sfpm
rpm = revolutions per minute
R = feed per tooth per revolution
D = diameter of cutter in inches
F = feed rate in inches per minute
T = number of teeth

$$rpm = \frac{CS \times 12}{D \times 3.14} \qquad CS = \frac{D \times 3.14 \times rpm}{12} \qquad F = R \times T \times rpm$$

   a. .072 b. 3.6 c. 13 d. 24 e. 191

11. What do we call the practice of when companies bond together economically?
    a. Kaizen b. Kanban c. Keiretsu d. Poka-Yoke e. Benchmarking

12. Which is computed by dividing the available work time per day by the required number of parts per day?
    a. Kaizen b. Kanban c. Keiretsu d. Theory of Constraints e. Takt time

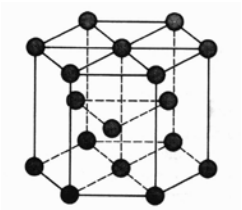
13. Which plastic is often mixed with fibers and is used to make spas?
    a. polyamide b. silicone c. polyester d. tetrafluoroethylene e. acetal

14. Which plastic has the highest strength-to-weight ratio of any material when mixed with graphite?
    a. polyurethane b. silicone c. phenolic d. polyester e. epoxy

15. Which type of load occurs by pulling or stretching a part from opposite sides?
    a. impact b. tension c. compression d. shear e. torsion

16. What is the point at which the specimen will no longer return to its original shape?
    a. yield strength c. yield point e. proportional limit
    b. elastic limit d. ultimate tensile strength

17. What kind of unit cell is this?
    a. body-centered cubic
    b. face-centered cubic
    c. close-packed hexagonal
    d. flat-centered cubic
    e. none of these



18. What does the G-code G01 tell the CNC machine?
    a. turn on the spindle c. rapid traverse
    b. change the tool d. linear interpolation

19. What is the name of this robot?
    a. Cylindrical
    b. Polar
    c. SCARA
    d. Gantry
    e. Articulated

20. Quality characteristics that are classified as conforming or nonconforming to specifications such as a "go/no go gage" applications are referred to as _____ data?
a. variable b. continuous c. attribute d. either A or C

21. Which one of the following is <u>not</u> correct with respect to the total area under the curve associated with $\pm 1\sigma$, $\pm 2\sigma$, and $\pm 3\sigma$?
a. 99.73% b. 95.46% c. 90.34% d. 68.26%

22. Variation is present in every process. Which one of the following statements is <u>not</u> true?
a. principal sources of variation include equipment, materials, environment, and operator.
b. automation has increased the effects of environmental variation.
c. equipment variation includes, but is not limited to, tool wear, vibration, and part positioning.
d. material variations can occur in both the finished product and raw material.

23. Which of the following is a hardwood?
a. maple b. pine c. redwood d. cedar

24. Which type of joint is half the material removed from each piece to be fastened?
a. miter b. dado c. groove d. lap

25. How is 1/8" written as a decimal?
a. .018" b. .0625" c. .125" d. .625" e. .0125"

26. What device allows current to flow in only one direction?
a. resistor b. coil c. capacitor d. diode

27. How many watts does a 110 volt circuit use that draws 20 amps?
a. 220 b. 2200 c. 5.5 d. .19

28. How much current is required for a 220 volt circuit with a 100 ohm resistor?
a. 2.2 b. .45 c. 22,000 d. 100

29. Which type of team is most commonly used in business?
a. work b. virtual c. problem solving d. cross functional

30. What is the development and maintenance of sound on-the-job relationships with subordinates, peers, and superiors?
a. Respect b. Relationship Building c. Human Relations d. Communication

References

MANUFACTURING-RELATED SECTIONS

- DeGarmo, E. P., Black, J. T., and Kohser, R. A. (2008). Materials and processes in manufacturing (10th ed.). New York: Macmillan Publishing Co., Inc.
- Kalpakjian, S., Schmid, S. R. (2006). Manufacturing engineering and technology (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall, Inc.
- DuVall, J. B., Hillis, D. R. (2008). Manufacturing processes: Automation, materials, and packaging (2nd ed.). Tinley Park, IL: The Goodheart-Willcox Company, Inc.
- Most manufacturing texts cover this material.

PRODUCTION PLANNING

- Minty. G. (1998). Production planning and controlling: A problem-based approach.. Tinley Park, IL: The Goodheart-Willcox Company, Inc.

SUPERVISION/MANAGEMENT

- Greer, C. R. and Plunkett, W. R. (2003). Supervision: Diversity and teams in the workplace. (11thed.). Upper Saddle River, NJ: Pearson Prentice Hall, Inc.
- Robbins, S. P. (2003). Organizational Behavior (10th edition). Upper Saddle River, NJ: Pearson Prentice-Hall, Inc.

TECHNICAL DRAFTING

- Brown, W. C., Kicklighter, C. E. (2008). Drafting and design (7th ed.). Tinley Park, IL: The Goodheart-Willcox Company, Inc.
- Giesecke, F. E. et al. (2002). Technical Drawing (12th ed.). Upper Saddle River, NJ: Pearson Prentice Hall, Inc.
- Any basic drafting text should cover this material.

QUALITY

- Besterfield, D. H. (2008). Quality control (8th ed.). Upper Saddle River, NJ: Pearson Prentice-Hall, Inc..
- Aiken, C. Harold. (2006). Quality: A corporate force managing for excellence. Upper Saddle River, NJ: Pearson Prentice-Hall, Inc..
- Goetsch, David L. & Stanley B. Davis. (2006). Quality management: introduction to total quality management for production, processing, and services. Upper Saddle River, NJ: Pearson Prentice-Hall, Inc.
- Any quality book covering control charts, distributions, and diagrams.

COMPUTER INTEGRATED MANUFACTURING

- Rehg, J. A., Kraebber, H. W. (2005). Computer-integrated manufacturing (3rd ed.). Upper Saddle River, NJ: Pearson Prentice-Hall, Inc.
- Should know the G and M codes for CNC programming.
- Any robotics text that classifies robots.

ELECTRONICS

- Miller, R., Miller, M. R. (2002). Electronics the easy way (4th ed.). Hauppauge, NY: Barron's Educational Series, Inc.
- Any basic electronics text should cover this material.

Recommendations for Taking the ATMAE Exam

- Thoroughly review this Study Guide and review the reference textbooks.
- You do NOT have to pass each section. Only a composite passing score is required.
- Rest well the night before the exam.
- Do NOT leave any questions blank. All questions are multiple choice, so make an educated guess at questions containing content you may not be familiar with.
- Don't panic! You do know this material or your instructor, mentor, or colleague would not want you to take the exam.
- Pace yourself. There are 180 questions and you have 120 minutes (2 hours) to finish.
- Don't spend too much time on one question because all questions are worth the same.
- Flag questions you are unsure of and come back to them at the end if you have time.
- Maintain a positive attitude. You can always retake the exam if you do not pass.

Answers for Sample Questions

1. b 2. c 3. b 4. b 5. c 6. a 7. c 8. c 9. e 10. e

11. c 12. e 13. c 14. e 15. b 16. b 17. c 18. d 19. b 20. c

21. c 22. b 23. a 24. d 25. c 26. d 27. b 28. a 29. c 30. c

ATMAE Certified Manufacturing Specialist Examination General Information

Policy

The Board of Certification shall design and administer certification examinations for all individuals. The examinations shall be administered online as requested. The areas covered by the examinations and the minimum acceptable scores shall also be determined by the Board of Certification.

Examination Information

The ATMAE Manufacturing Specialist Certification Examination is currently available for use for individual certification and as a program assessment examination. The exam is an *open book, 180-question, multiple choice examination with questions on the following 16 content areas: Manufacturing Joining, Forming, and Casting, Machining, Non Traditional Machining, Polymers, Industrial Materials, Computer Integrated Manufacturing, Production Planning, Quality; Management & Supervision, Metrology, Wood Technology, Technical Drafting, Manufacturing Philosophies, and Electronics. (*Examinees are allowed to use printed reference materials (e.g., reference texts) during the exam. However, internet or software-based references are not allowed to be used during the exam. Oversight of this is the responsibility of the exam proctor.)

Individual Examinations

Individuals interested in taking the exam on an individual basis should arrange for an exam proctor, and schedule the exam online at www.atmae.org If the individual passes and wants to become certified, they will be responsible for submitting an application and paying the appropriate ATMAE membership fee, and certification documentation fee. *Note:* If you are an individual with disabilities and need academic accommodations, please call ATMAE at (919) 635-8335 to make the necessary arrangements for you to take the test.

Certification after Examination

Examinees who have passed the ATMAE Certified in Engineering Graphics Examination and who apply for ATMAE Certification will be certified by ATMAE upon receipt of their application and payment of all applicable fees. The ATMAE Office usually has confirmation of examination results within two weeks of the date of the examination. Applicants must be ATMAE members or join ATMAE in order to be certified. You can become an ATMAE member by simply applying and paying online at www.atmae.org or by calling ATMAE at (919) 635-8335. If applying for certification after passing the exam, you will need to pay relevant membership fees and indicate on the application form the approximate date of the exam and the location at which you took the exam so that ATMAE can verify your exam results.

Program Assessment

When used for program assessment purposes, the exam fees are typically paid by the Program or Department using the exam. Aggregate exam scores, and comparative score information, are released to the Program or Department contact after the exams have been scored and the examination fee has been paid. For more information about the ATMAE Certification Examination or to obtain scores and determine your ATMAE Membership status before applying for certification, contact ATMAE by phone at (919) 635-8335 or by email at admin@atmae.org

Certificates

Certificates appropriate for framing are issued for one-year periods upon initial certification and upon annual renewal. In addition, individuals who passed the certification exam and stay current with all applicable membership and certification dues will be listed on the ATMAE Certification home page for recognition status by employers and colleagues.