Date: February 26, 1972

Time Allowed: 4 Hours
(Including time for fingerprinting and taking record of answers)

Test No. 2627 PROBATION TO MACHINIST

Written Test - Weight 35

Municipal Reference Center
230 Municipal Building
New York, N.Y. 10007
566-4282

ED.464

TEST BOOK
First Ball: Test book given out.
Second Ball: Turn the page and begin test.
Third Ball: End of test. Stop and get ready for intermission. This is your ball. If you finish your hand to call the

TEST BOOK
- This test book has 30 pages and is check your book to be sure it has

For future use, you may make a copy book and take it with you when you this purpose after the signal is

You must hand in your official test.

WARNING
You are not allowed to copy answers from anyone or to use books or notes or to take the test for somebody else or to let somebody else take the test for you.

After the test begins, nobody can leave before 1:00 P.M. No one can leave at all until he has been fingerprinted. If you are not out being fingerprinted, your test paper will not be marked.

Nobody can come in after 10:30 A.M.

If you want to drop out of the test and not have your answers marked, write "I withdraw" on your answer sheet and sign your name.
DIRECTIONS FOR ANSWERING QUESTIONS

Answer all the questions on the official answer sheet before the third bell rings. ONLY YOUR OFFICIAL ANSWER SHEET WILL BE MARKED.

Use a No. 2 pencil to mark your answer. If you want to change an answer, erase it completely and then mark your new answer. For each question, pick the best answer. Here is a sample of how to mark your answers:

SAMPLE O: When we add 5 and 3, we get
(A) 11  (B) 8  (C) 4  (D) 2.

Since 5 plus 3 is 8, the answer is B and you mark your answer sheet like this:
SAMPLE O: (A) ***** (B) ****** (C) ***** (D) *****.

In other words, you use your pencil to fill in the space between the two dotted lines to the right of the letter B on your answer paper. More than one answer to a question will be counted as a wrong answer.

1. Proper engagement of the back gears of a lathe will
   (A) provide increased torque
   (B) act as a brake to stop the lathe
   (C) increase the speed of the work piece
   (D) provide increased power.

2. A device used to accurately determine location dimensions which are to be produced by machining is known as a
   (A) fixture
   (B) jig
   (C) gage
   (D) clamp.

3. A caliper gage is used for checking
   (A) both internal and external dimensions
   (B) external dimensions only
   (C) internal dimensions only
   (D) the concentricity of two diameters.

(Continued on Page 3)
4. The actual dimension of a bored hole can be read directly by using
   (A) a tube micrometer  (C) a vernier caliper
   (B) inside calipers    (D) a telescoping gage.

5. It is preferable to ream dry rather than use a cutting fluid when reaming
   (A) bronze            (C) steel
   (B) cast iron         (D) aluminum.

6. The cutting edge of a cold chisel that has been heated for hardening and
   tempering should be quenched when its color is
   (A) yellow            (C) pale blue
   (B) white             (D) purple.

7. When tapping to the bottom of a blind hole, the best practice is to use a
   (A) bottoming tap only
   (B) taper tap and a bottoming tap
   (C) plug tap and a bottoming tap
   (D) taper tap, plug tap, and bottoming tap.

8. The quenching of the tool in the heat treatment of high speed steel is usually
   accomplished in
   (A) an atmosphere of nitrogen
   (B) a solution of tri-sodium-phosphate
   (C) distilled water
   (D) mineral oil.

9. The preferred method of setting the height on a surface gage is to use
   (A) a combination square  (C) inside calipers
   (B) outside calipers     (D) a dial indicator.

10. Nine exposed graduations on the barrel of an ordinary micrometer and 16
    graduations on the thimble, as shown below, indicates a reading of most nearly

    \[ \begin{array}{c}
    0 \\
    1 \\
    2 \\
    15 \\
    \end{array} \]

    (A) 0.215          (C) 0.241
    (B) 0.239          (D) 0.266.
1. Nitriding is a process which, if properly carried out will
   (A) through harden low carbon steel
   (B) through harden special alloy steels
   (C) surface harden special alloy steels
   (D) surface harden standard steels.

2. An irregularly shaped piece of work can be most accurately centered for lathe work by use of a
   (A) four jaw independent chuck
   (B) drill chuck
   (C) draw in collet chuck
   (D) three jaw universal chuck.

3. In cutting a gear having 26 teeth, on a milling machine equipped with an index head (40 to 1 ratio) and a plate having circles of 24-25-28-30-37-38-39-41-42-43 holes, the amount to index for each tooth would be
   (A) 1 turn and 21 spaces on the 39-hold circle
   (B) 8 spaces on the 25 hole circle
   (C) 1 turn and 16 spaces on the 30 hole circle
   (D) impossible on the plate specified.

4. In milling a piece of round stock with 15 longitudinal flats, 24 degrees apart, on a milling machine equipped with an index head (40 to 1 ratio) and a plate having circles of 46-47-49-51-53-54-57-58-59-62-66 holes, the maximum number of circles on which it is possible to properly index the piece is
   (A) 4 circles of holes
   (B) 3 circles of holes
   (C) 2 circles of holes
   (D) 1 circle of holes.

5. The operation of cutting off stock in a lathe requires, among other things, that
   (A) an offset cutting off tool should never be used
   (B) the stock be rigidly held and the cut be made as close to the chuck as possible
   (C) a spring tool should never be used
   (D) a solid cutting off tool be set slightly below center to prevent "digging in".

6. A common hardness tester that determines hardness by the penetration of a diamond cone into the material to be tested is the
   (A) Brinnell
   (B) Rockwell B
   (C) Durometer
   (D) Rockwell C.

7. The carbide insert on a carbide tool is usually not fastened to the body by
   (A) brazing
   (B) silver soldering
   (C) mechanical means
   (D) electric welding.

(Continued on Page 5)
The following four (4) questions numbered 18 to 21 inclusive are to be answered in accordance with FIGURE 1, shown below.

FIGURE 1
(not to scale)

NOTE: Dimensions with 3 decimal places have tolerance of ± .010
Dimensions with 2 decimal places have tolerance of ± .030
Dimensions with 1 decimal place have tolerance of ± .060

Material - 5" dia. 1025 Bar Stock

18. Referring to FIGURE 1, the possible maximum and minimum values of dimension A are most nearly
   (A) 4.150 and 3.850
   (B) 4.130 and 3.870
   (C) 4.110 and 3.890
   (D) 4.070 and 3.930.

19. Referring to FIGURE 1, the possible maximum and minimum values of dimension B are most nearly
   (A) 5.600 and 5.400
   (B) 5.540 and 5.460
   (C) 5.520 and 5.480
   (D) 5.510 and 5.490.

20. With reference to FIGURE 1, a gear to be installed on the shaft at location C is bored to 4.4970/4.4975. The fit of the gear on the shaft would be most nearly
   (A) .0005 to .001 loose
   (B) a snug fit
   (C) .0005 to .001 interference
   (D) .002 to .003 interference.

21. With reference to FIGURE 1, the surfaces which could best be finished on a lathe would be
   (A) 
   (B) 
   (C) 
   (D) 

(Continued on Page 6)
1. In machining magnesium and its alloys, the cutting fluid is usually
   (A) mineral seal oil
   (B) 1 to 25 soluble oil
   (C) 1 to 10 soluble oil
   (D) 1 to 100 aqueous solution of caustic soda.

23. For the finishing operation in draw filing it is preferable to use a
   (A) mill file
   (B) vixen file
   (C) cabinet file
   (D) square file.

24. A properly manufactured trolmaker's button must have
   (A) one end threaded
   (B) ID and OD concentric within .0005"
   (C) an accurately ground OD
   (D) an accurately ground ID.

25. The principal feature distinguishing a universal knee and column milling machine from
    the plain milling machine is the
   (A) work table which may be swiveled in a horizontal plane
   (B) vertical spindle
   (C) work table which may be swiveled in a vertical plane
   (D) quill that moves in the horizontal plane.

26. When using the threading dial while cutting a thread on a lathe it is not proper to
    close the split nut at
   (A) any un-numbered line on the dial for 5 1/4 threads per inch
   (B) any odd-numbered line on the dial for 4 1/2 threads per inch
   (C) any line on the dial for 10 threads per inch
   (D) any numbered line on the dial for 13 threads per inch.

27. A 2" thick flat piece is to be machined over its entire 10" x 36" top surface on a
    planer. The most desirable clamping arrangement to use would be
   (A) two planer strips
   (B) poppets and toe dogs
   (C) step blocks and clamps
   (D) a planer vise.

28. The machining process for which a specialized machine has never been developed is
   (A) hobbing
   (B) shaping
   (C) boring
   (D) reaming

29. The usual number of flutes on a square hole drill is
   (A) 2
   (B) 3
   (C) 4
   (D) 5.

(Continued on Page 7)
30. The best method to use to obtain a good commercial finish on cast iron being machined on a planer is to use a

(A) wide square nose tool with light chip and coarse feed
(B) round nose tool with light chip and fine feed
(C) wide square nose tool with heavy chip and fine feed
(D) round nose tool with heavy chip and fine feed.

31. The most nearly correct statement that can be made about the use of cat heads on a lathe is that they are used

(A) as center rests
(B) as follower rests
(C) to support tubes
(D) to stiffen tool posts.

32. There are 2.54 centimeters to 1 inch and 10 millimeters to a centimeter. If a piece of stock is 1600 millimeters long, its length in feet and inches would be, most nearly

(A) 3 feet 1-1/2 inches
(B) 5 feet 3 inches
(C) 7 feet 4-1/2 inches
(D) 9 feet 6 inches.

33. A special lathe has a cross feedscrew that has 10 threads per inch and a scale on the cross feedscrew that has 25 equal divisions. To take a second cut on a piece of stock in order to reduce the stock diameter by .020", the feed should be moved in most nearly

(A) 10 divisions
(B) 5 divisions
(C) 2 1/2 divisions
(D) 1 1/2 divisions.

34. When rolling external threads, the outside diameter of the material to be threaded should be approximately the

(A) pitch diameter of the thread
(B) major diameter of the thread
(C) root diameter of the thread
(D) minor diameter of the thread.

35. In connection with the tool head and clapper box of a horizontal ram shaper it is most nearly correct to state that

(A) the clapper box can swivel but the tool head is fixed
(B) the tool head can swivel but the clapper box is fixed
(C) both the tool head and the clapper box are fixed
(D) both the tool head and the clapper box can swivel.

36. A 4" diameter circular disk is to have an off-center hole drilled for a shaft which will convert the disk into a cam with a lift of 3". The machinist should know that

(A) the hole should be drilled 1/2" off center
(B) the hole should be drilled 1" off center
(C) the hole should be drilled 1 1/2" off center
(D) the job is impossible.

37. If specifications call for tightening a nut with a torque of 180 foot pounds, the tangential force applied to the end of a 20 inch wrench would have to be most nearly

(A) 9 lbs.
(B) 54 lbs.
(C) 108 lbs.
(D) 216 lbs.

(Continued on Page 3)
38. Safe working habits are the responsibility of the
   (A) foreman  (C) individual
   (B) insurance company  (D) safety committee.

39. When filing a rotating work piece on a lathe it is generally best to
   (A) use long slow strokes
   (B) use short quick strokes
   (C) hold the file still against the revolving work
   (D) run the lathe in reverse.

40. The type of band saw blade best suited for cutting alloy steels is a
   (A) spring-temper
   (B) claw tooth
   (C) buttress
   (D) precision.

41. With respect to grinding wheels, it is most nearly true that
   (A) abrasive cut off wheels are usually made with a vitrified bond
   (B) organic bonds are usually best for fine finishes
   (C) aluminum oxide abrasive wheels are usually used for grinding non-ferrous metals
   (D) wheels with close grain spacing are usually used when there are large areas of contact.

42. The cause of a rough furry finish on a low-carbon steel workpiece being machined on a lathe would most likely be
   (A) insufficient side relief angle
   (B) a positive back rake angle
   (C) excessive side rake angle
   (D) excessive end relief angle.

43. With constant work speed and feed, the increase of grinding wheel speed from 5000 to 7500 SFPM would usually require the use of a
   (A) softer vitrified wheel
   (B) harder vitrified wheel
   (C) softer resinoid wheel
   (D) harder resinoid wheel.

44. A knee and column milling machine overarm normally supports the
   (A) index head
   (B) workpiece
   (C) spindle
   (D) outer end of the cutter arbor.

45. The statement which is not true concerning a 6" x 18" horizontal, reciprocating table surface grinder is that
   (A) the wheelhead is lowered to provide the infeed
   (B) the table is raised to provide the infeed
   (C) the 6" x 18" refers to the working area of the table
   (D) the table has a reciprocating motion under the grinding wheel.

(Continued on Page 9)
46. A piece of 4" diameter low carbon steel is to be turned on a lathe for a distance of 2 feet, as shown.

If the cutting speed is to be 250 FPM and "the feed 1/32", the time to make this in one cut would be most nearly

(A) 1.6 minutes  (B) 3.2 minutes  (C) 6.4 minutes  (D) 12.8 minutes

47. The tailstock offset to machine the tapered section of the part shown below is most nearly

(A) 0.500"  (B) 0.250"  (C) 0.050"  (D) 0.025"

48. In connection with a universal cutter and tool grinder it is most nearly correct to state that it

(A) can grind most machinists' tools with the exception of milling cutters
(B) uses cup type grinding wheels exclusively
(C) cannot be used to grind tapers
(D) is fitted with a tailstock and headstock similar to those on a lathe.

49. The type of drill which is usually preferred for drilling brass is a

(A) flat drill
(B) twist drill with no lip clearance
(C) twist drill with a 70 degree cutting edge angle
(D) twist drill with 6 degree lip clearance.

(Continued on Page 10)
50. When using a boring bar to bore a hole in the end of a shaft or a bushing with the steady rest at one end and slightly out of line with the line center at the other end the resulting hole will

(A) have parallel sides
(B) be tapered
(C) be eccentric to the outside of the shaft
(D) be out of round.

The following five (5) questions numbers 51 to 55 inclusive are to be answered in accordance with FIGURE 2, shown below.

FIGURE 2
(not to scale)

51. With reference to FIGURE 2, the possible maximum and minimum values of dimension A are most nearly

(A) 2.760 and 2.740
(B) 2.780 and 2.720
(C) 2.750 and 2.745
(D) 2.750 and 2.740

52. With reference to FIGURE 2, the possible maximum and minimum values of dimension B are most nearly

(A) 2.260 and 2.220
(B) 2.255 and 2.225
(C) 2.250 and 2.230
(D) 2.245 and 2.235.

(Continued on Page 11)
53. With reference to FIGURE 2, the size of the angle C, in degrees, is most nearly
   (A) 135  (C) 165
   (B) 155  (D) 175.

54. With reference to FIGURE 2, the maximum value of dimension D is most nearly
   (A) 1.6415  (C) 1.6200
   (B) 1.6405  (D) 1.6375.

55. With reference to FIGURE 2, the minimum value of dimension D is most nearly
   (A) 1.6105  (C) 1.6140
   (B) 1.6125  (D) 1.6155.

56. The proper cutter to use when milling reamer teeth can best be called a
   (A) side milling cutter  (C) double angle cutter
   (B) helical slab cutter  (D) facing cutter.

57. In drill press work, when cutting a groove in the sloping edge of a hole for the purpose of drawing the drill back to place, the recommended chisel to use is a
   (A) flat cold chisel  (C) cape chisel
   (B) roundnose chisel  (D) diamond-point chisel.

58. In the cutting of sheet metal of less than 18-gage thickness it is recommended that the hack saw blade to be used be a/an
   (A) flexible back blade with 32 teeth per inch
   (B) all-hard blade with 32 teeth per inch
   (C) flexible back blade with 18 teeth per inch
   (D) all-hard blade with 18 teeth per inch.

59. In "normalizing" steel, the steel after being heated is cooled in
   (A) a brine bath  (C) a water bath
   (B) an oil bath  (D) air.

60. The most nearly correct statement that can be made about a jig borer is that it is
   (A) frequently used for layout work
   (B) a production machine with accuracy limited to .001"
   (C) of light and flexible construction to facilitate its movement about the shop
   (D) recommended for use in heavy milling.

(Continued on Page 12)
61. The width of a shoulder, 1/2" deep in a 3/4" slot which is closed at both ends, as shown, is most easily measured by

(A) short rule and holder
(B) hook rule
(C) standard steel rule
(D) rule depth gage.

62. A vernier scale on a rule gives the reading indicated below, which when properly read is most nearly

<table>
<thead>
<tr>
<th>Option</th>
<th>Reading</th>
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<tbody>
<tr>
<td>(A)</td>
<td>0.431</td>
</tr>
<tr>
<td>(B)</td>
<td>1.431</td>
</tr>
<tr>
<td>(C)</td>
<td>1.436</td>
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<tr>
<td>(D)</td>
<td>4.360</td>
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</table>

63. Eleven exposed graduations on the barrel of a metric micrometer and 28 graduations on the thimble, as shown below, indicates a reading of most nearly

(A) .0578 mm
(B) .5780 mm
(C) .5780 cm
(D) 5.780 cm.

64. Of the following SAE steel grade designations, the one which designates a nickel-chromium-molybdenum steel is

(A) SAE 1040
(B) SAE 3140
(C) SAE 4340
(D) SAE 5140.

(Continued on Page 11)
65. The input speed to the shown gear train is 933 RPM.

![Diagram of gear train]

The output speed, in RPM, would be most nearly

(A) 50  
(B) 100  
(C) 150  
(D) 200.

66. In considering the use of bandsaws, the most-nearly correct statement among the following is this:

(A) most bandsaws are driven by the upper band wheel  
(B) the speed of the bandsaw is usually measured by the RPM of the lower band wheel  
(C) the speed of the bandsaw is usually measured in SFPM  
(D) for purposes of safety, no bandsaw table is made to be tilted.

67. When setting up an index head, the index plate and sector are not used when operating with:

(A) simple indexing  
(B) compound indexing  
(C) differential indexing  
(D) direct indexing.

68. A rectangular block of steel, 6" x 8" x 1/2" is laid flat on a horizontal bandsaw table and cut in half from corner to corner. The length of the cut is most nearly

(A) 12"  
(B) 11"  
(C) 10"  
(D) 9".

69. Consider a gear and a pinion in which the gear has 190 teeth and the pinion 50 teeth. If the diametrical pitch of the set is 3, these gears would run on a center distance of

(A) 16 inches  
(B) 20 inches  
(C) 30 inches  
(D) 40 inches.

70. Measurements on steel parts machined to an accuracy of .001" should be made at temperatures of

(A) 50–55 deg. F.  
(B) 60–63 deg. F.  
(C) 68–70 deg. F.  
(D) 80–85 deg. F.

(Continued on Page 14)
71. The recommended cutting speed for turning medium steel with a 3/32" depth of cut and a 1/32" feed using properly ground high-speed steel tools is most nearly

(A) 15 FPM  
(B) 30 FPM  
(C) 60 FPM  
(D) 120 FPM.

72. For ease in performing trigonometric calculations, sintered bars are manufactured in standard lengths. One of these standard lengths is

(A) 1"  
(B) 2"  
(C) 2.5"  
(D) 20".

73. The most accurate method of setting an angle involves the use of

(A) a sine bar and gage blocks  
(B) angle blocks  
(C) a vernier universal bevel protractor  
(D) a planer gage and combination bevel.

74. A counterbore is to be used to enlarge a 1" deep, 1/2" diameter hole to a 5/8" concentric diameter section for the upper 1/4" of its depth. The size of the counterbore pilot should be most nearly

(A) 1/4"  
(B) 1/2"  
(C) 5/8"  
(D) 1".

75. The instrument which is generally used for measuring diameters of holes or the width of slots too deep for use of a micrometer or vernier calipers is called a

(A) surface gage  
(B) depth gage  
(C) sine bar  
(D) telescoping gage.

76. The recommended speed for drilling mild steel with a 1 1/2" high speed drill and a feed of .015" per revolution with use of soluble coolant is most nearly

(A) 25 RPM  
(B) 90 RPM  
(C) 150 RPM  
(D) 300 RPM.

77. In the AISI designations of types of steel, a molybdenum steel is designated as

(A) 1020  
(B) 4027  
(C) 5130  
(D) 6150.

78. Your foreman points out a machinist in your shop and tells you that he is a very tractable man. This means most nearly that

(A) he is irritable and seldom completes a job willingly  
(B) his superiors very seldom have difficulties with him  
(C) he is very difficult to get along with  
(D) he is a perpetual tool borrower.

(Continued on Page 15)
79. When a machinist states that there are "very significant discrepancies in two views on this point", he means most nearly that

(A) two views do not describe the same piece
(B) unusual care must be exercised in making the two pieces
(C) the information given is not complete
(D) one view is missing.

80. A pyrometer is most usually used

(A) test the strength of steel
(B) measure the temperature in a heat treating furnace
(C) test for degree of hardness
(D) determine elastic limit.

END OF WRITTEN TEST
Correct Answers For All Questions In The Test

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