MARKING GUIDELINE

NATIONAL CERTIFICATE

FITTING AND MACHINING THEORY N2

APRIL 2012

This marking guideline consists of 8 pages.
SECTION A: ALL QUESTIONS ARE TO BE MARKED IN THIS SECTION

QUESTION 1: OCCUPATIONAL SAFETY

NOTE: Candidates need ONLY QUESTION 1.1 or QUESTION 1.2

1.1
- Use the correct equipment – within the capacity it is designed for. (1)
- No person – beneath a load when in use (1)
- Do not leave a load unattended (1)
- SWL must be displayed on all equipment (1)
- The weight of the load must be less than the SWL marked on the equipment. (1)
- Only person trained in mechanical handling to use lifting machinery (1)
- Standard hand signals to be used when using mech. handling equipment. (1)
- Mechanical handling equipment to inspected frequently (1)
- Safety devices, eg. Sirens/warning bells should be in good working order. (1)

[5]

OR

1.2
- Tobacco (1)
- Matches (1)
- Lighter (1)
- Cigarettes (1)
- Smoking pipe (1)
- Any device used to strike or cause a flaming light (1)

[5]

QUESTION 2: COUPLINGS

2.1
- shafts that form large angles with each other Connects (1)

2.2
- Housing (1)
- Blades/vanes (1)
- Input shaft (1)
- Output shaft (1)
- Driven unit or follower (1)
- Drive unit or impeller (1)

[4]

2.3
- Permanent/fixed/solid-coupling (1)

[6]
QUESTION 3: LIMITS AND FITS

3.1  85.26mm  (1)
3.2  85.87mm  (1)
3.3  84.74mm  (1)
3.4  85.00mm  (1)
3.5  0.38mm   (1)
3.6  1.13mm   (1)
3.7  A pin 0.26 bigger than the hole (interface)  (1)

QUESTION 4: BEARINGS

4.1  • Requires a lubricating device / equipment
     • Start-up torque is high
     • Increased power consumption
     • Can be easily damaged by dirt or grit
     • When the lubrication is stopped – the bearing could seize
     • Very high friction properties  (4)

4.2  • radial
     • Angular  (3)
     • Thrust  [7]

QUESTION 5: LUBRICATION AND VALVES

5.1  • Sight feed lubricator
     • Bottle feed lubricator
     • Drip feed lubricator
     • Wick feed lubricator
     • Needle valve lubricator  (2)

5.2  Cold Point (Pour point) the lowest temperature at which a lubricant will stop flowing  (1)

5.3  5.3.1 Wick-feed  (1)
     5.3.2 Bottle-oiler
     5.3.3 Tell-tale lubricator
     5.3.4 Stauffer grease cup  (4)

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QUESTION 6: PACKING, STUFFING BOXES AND JOINTS AND WATER PIPE SYSTEMS

6.1 Outside diameter (OD) minus the inside diameter (ID); OR The difference between the outside diameter (OD) and the inside diameter (ID) (2)

6.2 • Creased bend
• Full loop
• Horseshoe
• Expansion bend (4)

6.3 • retain heat or prevent heat loss (1)
• Prevent waterhammer (1)
• Prevent water foaming in pipe lines (1)
• Prevent corrosion in pipe lines (1)
• To give proper gauge readings (1)
• To prevent water entering reciprocating steam pumps (1)

QUESTION 7: PUMPS

7.1 • Positive (2)
• Negative

7.2 First Stroke
Upward stroke (plunger moves up) – intake stroke
Vacuum is created and atmospheric pressure forces water into the cylinder
Upward stroke, the inlet valve is open and the discharge valve is closed.

Second Stroke
Plunger moves down (downward stroke discharge valve opens and the inlet valve closes
Water passes into the delivery column as the plunger forces water out of the cylinder (4)

QUESTION 8: COMPRESSORS

8.1 Pressure gauge (1)

8.2 Receiver/ tank (1)

8.3 Electric motor (1)

8.4 Drain valve (1)

8.5 pressure regulator switch (1)
QUESTION 9: V-BELT, GEAR AND CHAIN DRIVES

9.1  9.1.1 Relationship between the driver gear and the driven gear in a gear train. (1)

9.1.2 Pinion is the driver gear, connected to the electric motor or power source it is usually the smaller gear in the drive (1)

9.2  • can be used in limited space (compact) (1)
• 100% positive drive (1)
• Easy to lubricate (1)
• Little maintenance (1)
• Large amounts of power (1)
• Power is transmitted directly (without additional components) (1)

9.3  oil bath principle (1)

9.4  • Bevel (1)
• worm & worm wheel (1)
• spiral, (1)
• rack & pinion (1)

[8]

TOTAL SECTION A: 60

SECTION B
CANDIDATES NEED ONLY ANSWER TWO QUESTIONS IN THIS SECTION - SECTION B

QUESTION 10: HYDRAULICS AND PNEUMATICS

10.1 • quiet (1)
• clean (1)
• faster (1)

10.2 • more power/torque (1)
• cheaper (1)
• more robust, rigid sturdy (1)

10.3 • Electrical (1)
• Mechanical / Physical (1)
• Fluid? Pilot pressure (1)

10.4 10.4.1 provides a fluid pressure source (1)
10.4.2 directs the flow of fluid pressure to the actuator as well as the tank (1)
10.4.3 ensures good clean oil/fluid supply to the circuit (1)
10.5
- reservoir
- pressure relief valve
- electric motor
- pump
- piping

10.6
10.6.1 4/2 way – muscular actuation
10.6.2 Pressure relief valve
10.6.3 4/3 way N/C
10.6.4 Double acting cylinder
10.6.5 Flow-control or throttle valve

10.7
10.7.1 Motor with limited direction
10.7.2 Compressor
10.7.3 Single direction motor
10.7.4 Two-direction motor
10.7.5 Vacuum pump

QUESTION 11: CENTRE LATHES

11.1
11.1.1 Used to mount workpieces that have internally threaded holes
11.1.2 Group mandrels hold several but similar workpieces so that the work can be done in a single operation

11.2.1
- auto feed
- smooth finish
- long tapers

11.2.2
- small angles only
- external tapers only
- set up time is longer

11.3
- Fixed
- Travelling
11.4  
- Material type  
- Sequence operation  
- Coolant application  
- Dwell time  
- Stock length  
- Tooling required  
- Sizes according to dimensional positioning  

11.5  
1) Set-over = length of work-piece/2 \times \text{ratio}  
2) 300/2 \times \frac{1}{7}  
3) = 10.5 \text{mm}  

11.6  
1) Pitch Circumference = \pi \times \text{Pitch Diam} = \pi \times 90 = 282.74 \text{ mm}  
2) Lead=\text{No of starts} \times \text{Pitch}=3 \times 7 \text{ mm} = 21 \text{ mm}  
3) Therefore \varnothing = \tan^{-1} 0.074 = 4.25^\circ  

QUESTION 12: MILLING MACHINES AND SURFACE GRINDERS  

12.1  
12.1.1 Helical cutter (with nicked teeth)  
12.1.2 Endmill cutter  
12.1.3 Slot drill cutter  

12.2  
- Dividing Head  
- Footstock  
- Machine use  
- Slotting attachment  
- Rotary table  

12.3  
- wheel speed to slow  
- metal clogging the space between abrasive particles  
- coolant dirty  
- wrong wheel / choose coarser grit  
- wheel needs dressing  

12.4  
1) S = \pi D N  
2) = \pi \times 0.090 \times N  
3) = 30 \text{ m/min}  

12.5  
12.5.1 good finish  
12.5.2 deeper cuts  
12.5.2 slower feed  
12.5.2 subject to vibration  

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12.6  
- power consumption is reduced  
- chattering is reduced  
- shavings are broken into small pieces  
- easier removal  
- better cutting action  
- better surface finish.

TOTAL SECTION B: 60  
GRAND TOTAL: 100