MARKING GUIDELINE

NATIONAL CERTIFICATE

AUGUST EXAMINATION

FITTING AND MACHINING THEORY N2

24 JULY 2012

This marking guideline consists of 7 pages.
SECTION A

QUESTION 1: OCCUPATIONAL SAFETY

1.1 1.1.1 True ✓ 1.2.1 True ✓ (1)
1.1.2 False ✓ 1.2.2 False ✓ (1)
1.1.3 False ✓ OR 1.2.3 False ✓ (1)
1.1.4 False ✓ 1.2.4 False ✓ (1)
1.1.5 True ✓ 1.2.5 True ✓ (1)

[5]

QUESTION 2: COUPLINGS

2.1 • Flange ✓
• Gear ✓
• Marine ✓
• Chain ✓
• Fluid ✓ (5)

2.2 Correct alignment allows for more efficient operation of machinery. ✓
Greater cost savings as a result of less maintenance materials being used. ✓
Downtime and overtime is minimized. (Any TWO) (2)

[7]

QUESTION 3: LIMITS AND FITS

3.1 Bi-lateral tolerance ✓ (1)
3.2 Uni-lateral tolerance ✓ (1)
3.3 3.3.1 0,02 mm ✓ (1)
3.3.2 0,05 mm ✓ (1)
3.4 Clearance ✓ (1)

[5]

QUESTION 4: BEARINGS

4.1 4.1.1 Embedability - white metal ✓ (1)
4.1.2 Load-carrying ability – cast iron ✓ (1)
4.1.3 Thermal conductivity – nylon ✓ (1)
4.1.4 Corrosion resistant – bronze ✓ (1)
4.2 • Ball ✓
• Roller ✓
• Spherical roller ✓
• Needle roller ✓

(Any THREE) (3)

[7]

QUESTION 5: LUBRICATION AND VALVES

5.1 Sight-feed lubricator ✓

(1)

5.2 This lubricator works on a taper needle and seat system. ✓ When the feed
handle is turned by hand either clockwise (it decreases) or anticlockwise (it
increases) oil flows to the bearing. ✓

(2)

5.3 5.3.1 Reservoir or oil glass container ✓
5.3.2 Sight glass ✓
5.3.3 Feed handle ✓
5.3.4 Tapered seat) ✓
5.3.5 Tapered needle ✓

(5)

[8]

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

6.1 6.1.1 - Expansion diaphragm ✓
6.1.2 - Telescopic expansion joint ✓
6.1.3 - Packed expansion sliding joint ✓
6.1.4 - Corrugated expansion ✓

(4)

6.2 - Rubber ✓
- Neoprene ✓
- Nylon ✓
- Teflon ✓

- Graphite
- Aluminium
- White Metal
- Cotton
- Asbestos

(Any FOUR) (4)

[8]

QUESTION 7: PUMPS

7.1 • Open and close valves gradually ✓
• Use an air chamber in the delivery line ✓

(2)

7.2 7.2.1 1
7.2.2 1
7.2.3 2
7.2.4 2

(1)

(1)

(1)

[6]
QUESTION 8: COMPRESSIONS

8.1 True √ (1)
8.2 False √ (1)
8.3 True √ (1)
8.4 False √ (1)
8.5 True √ (1)
8.6 False √ (1)
8.7 False √ (1)

[7]

QUESTION 9: BELT, CHAIN AND GEAR DRIVES

9.1 - can be used over both short and long distances √
- can be used for both light and heavy loads √
- maintenance can be done without interfering with other components √
- can be used as a multiple drive √
(Any TWO) (2)

9.2 Sag is destructive to the chain (shorter life span) √
Sag is detrimental to smooth running (low efficiency) √
Sag causes whipping and vibration (could derail) √
Ruins the drive and driven sprockets √
(Any TWO) (2)

9.3 • Solid √
• Solid with spokes √
• Split socket with spokes √

[7]

TOTAL SECTION A: 60

SECTION B

QUESTION 10: HYDRAULICS AND PNEUMATICS

10.1 It protects the hydraulic system from excessive pressure √ (1)

10.2 - Noise factor √
- Cost factor √
- Power to weight ratio required √
- Cleanliness factor √
- Speed factor √
- Rigidity factor
(Any FIVE) (5)

10.3 10.3.1 Oil filter √
10.3.2 Tank √
10.3.3 Pressure relief valve √
10.3.4 Hydraulic pump √
10.3.5 Pressure gauge √
10.3.6 Actuator (cylinder) √
10.3.7 Oil level inspection glass √
10.3.8 Control valve √

10.4
- Ensure that hose fittings and pipes are not loose √
- Ensure oil is clean √
- Ensure that hoses and piping are clean prior to installation
- Ensure hoses and fittings are seated correctly
(Any TWO) (2)

10.5
- Lubricator √
- Pressure valve √
- Drain valve √
- Filter √
(4)

[20]

QUESTION 11: CENTRE LATHES

11.1
- Setting-up time is simple √
- Concentricity is guaranteed √
- Production of large quantities of similar work pieces is possible √
- Mandrels can be modified to suit a wide range of work √
- Even unskilled operators can set it up
(Any FOUR) (4)

11.2
- Graduated sleeve √
- Dial test indicator method √ (2)

11.3
Set-over = \( \frac{\text{length of work-piece} \times \text{ratio}}{2} \)
\[ = \frac{280 \times 1}{2} \]
\[ = 140 \]
\[ = 10 \text{ mm} \] (3)

Lead = No of starts \( \times \) pitch
\[ = 2 \times 10 \]
\[ = 20 \text{ mm} \]

Tan \( \varnothing \) = Lead / \( \times \) mean diameter
\[ = \frac{20}{\pi} \times 100 \]
\[ = 0.0634 \]

\( \varnothing \) = 1/Tan 0.0634
\[ = 3.64 \]

Helix angle = 3.38 √
11.4 11.4.1 To find helix angle
\[ \tan \theta = \frac{\text{lead}}{20} = 0.065 \]

Pitch Circumference 306,305 mm

Therefore \( \theta = \tan^{-1} 0.065 \)
\[ = 3.73^\circ \] \( (3) \)

11.4.2 To find leading angle
\[ = 90^\circ - (\text{helix + clearance angle}) \]
\[ = 90^\circ - (33^\circ + 3) \]
\[ = 83.22^\circ \] \( (1) \)

11.4.3 To find following angle
\[ = 90^\circ + (\text{Helix - clearance angle}) \]
\[ = 90^\circ + (33^\circ - 3^\circ) \]
\[ = 90.38^\circ \] \( (1) \)

11.5 11.5.1 Incremental – the distance from one point to the second point is given without referring to a common reference point \( \checkmark \) \( (1) \)

11.5.2 Absolute – all points taken from a common reference point \( \checkmark \) \( (1) \)

11.6 - material type \( \checkmark \)
- stock length \( \checkmark \)
- information from a drawing \( \checkmark \)
- operating sequence \( \checkmark \)
- tooling required
- dwell time
- coolant application
- sizes according to dimensioning position \( \text{(Any FOUR)} \) \( (4) \)

[20]

QUESTION 12: MILLING MACHINES AND SURFACE GRINDERS

12.1 12.1.1 Slab milling \( \checkmark \)
12.1.2 Gang milling \( \checkmark \)
12.1.3 Straddle milling \( \checkmark \)
12.1.4 Up-cut milling \( \checkmark \) \( (4) \)

12.2.1 Simple indexing \( \checkmark \) \( (1) \)

12.2.2 Application of the formula \( 40/N \) \( \checkmark \) \( (1) \)

12.3 \( 40/N \)
\[ = \frac{40}{13} \checkmark \]
\[ = \frac{3}{13} \checkmark \]
\[ = \frac{1}{13} \times \frac{3}{3} \]
\[ = \frac{3}{39} \checkmark \]
Therefore required indexing is 3 turns of the crank + 3 holes in a 39 hole circle √

12.4
- Vitrified √
- Silicate √
- Shellac √
- Resinoid √
- Rubber

(Any FOUR) (4)

12.5
- Abrasive type √
- Grain size √
- Grade √
- Structure number √
- Bonding material

(Any FOUR) (4)

12.6
Amount of ground √
Type of material to be ground √
Contact surface area √
Type of grinding machine
Accuracy required on work
Wheel speed
Rate (Pace) at which the work must be done
Conditions of the machine √
Skilled or unskilled person used

(Any THREE) (3)

[20]

TOTAL SECTION B: 60
GRAND TOTAL: 100