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**NATIONAL CERTIFICATE**

**FITTING AND MACHINING THEORY N2**

**30**

**JULY 2018**

**This marking guideline consists of 8 pages.**



**MARKING GUIDELINE**

**SECTION A**

# QUESTION 1

**NOTE: Candidates should only answer QUESTION 1.1 OR QUESTION 1.2.**

1.1 1.1.1 False

1.1.2 True

1.1.3 True

1.1.4 False

1.1.5 False (5 × 1) **[5]**

**OR**

1.2 1.2.1 False

1.2.2 True

1.2.3 False

1.2.4 False

1.2.5 True (5 × 1) **[5]**

# QUESTION 2

2.1 • Axial misalignment

* Radial misalignment
* Angular misalignment (3)

2.2 2.2.1 Nylon sleeve coupling

* + 1. Flexible couplings
    2. Nylon sleeve

(3 × 1) (3)

**[6]**

# QUESTION 3

3.1 • Standardisation and the interchangeability of parts are facilitated.

* Faulty machining and workmanship are accepted within certain limits. • Production is accelerated.
* Production costs are cut down. (4)

3.2 Interchangeability of parts is the substitution of a manufactured part with a

similar part manufactured from the same drawing. (2)

**[6]**

# QUESTION 4

4.1 4.1.1 The ability of the material to resist galling or seizing under poor lubrication conditions

4.1.2 The ability of the material to flow during the running-in process

4.1.3 The ability of the material to withstand the pressure experienced under loaded conditions

(3 × 1) (3)

4.2 Oil enters the bearing through an oil hole. The oil is then distributed in the

bearing along oil grooves. (2)

**[5]**

# QUESTION 5

5.1 • Drip-feed lubricator

* Siphon-wick lubricator
* Sight-feed lubricator
* Needle lubricator (Any 3 × 1) (3)

* 1. It is the temperature at which oil gives of vapour to burn continuously when

ignited. (1)

* 1. • They control the direction of flow.
* They control the pressure of flow. (2 × 1) (2)

**[6]**

# QUESTION 6

6.1 • They are used to prevent the leakage of steam, compressed air, oil, water or gases in a system.

* They prevent dirt and dust from entering into components of a system.

(2 × 1) (2)

6.2 • It has a low resistance to fatigue.

* It has a good resistance to acid corrosion.
* It's hardness and strength decreases at low temperatures.
* It has a low melting point.
* It has good embedability properties. (Any 3 × 1) (3)

6.3 • PVC tape

* Sisal string
* Teflon
* Copper jointing compound (4 × 1) (4)

# [9] QUESTION 7

7.1 • It is used to move a liquid from a lower to a higher level. • It is used to impart energy to a fluid (Any 1 × 1) (1)

7.2 7.2.1 A – Outlet

1. – Inlet
2. – Gear
3. – Casing (4 × 1) (4)

7.2.2 Rotary pump (1)

**[6]**

# QUESTION 8

8.1 It is to compress air in a container so that it can be used for driving pneumatic

power tools and machinery. (1)

8.2 As the lobed rotors turn, air is drawn into the inlet of the compressor. Air is then transferred along the outside, between the rotors and compressor casing towards the outlet. Due to the meshing of the rotors, pressure is built up at

the outlet and the air is forced out of the compressor. (4)

8.3 • Reciprocating compressors

• Rotary compressors (2 × 1) (2)

**[7]**

# QUESTION 9

9.1 9.1.1 Caused by excessive heat or chemical fumes

9.1.2 Caused by fluid contaminating the belt

9.1.3 Caused by improper installation

(3 × 1) (3)

9.2 • Cycloid gear tooth profile

* Involute gear tooth profile (2 × 1) (2)

9.3 • Single-strand or multiple-strand roller chains

* Silent chains
* Leaf chains (3 × 1) (3)

9.4 • To reduce the speed

* To increase the torque (2 × 1) (2)

**[10]**

**TOTAL SECTION A:** **60** **SECTION B**

Answer any TWO of the following three questions.

# QUESTION 10

|  |  |
| --- | --- |
| **HYDRAULIC SYSTEM** | **PNEUMATIC SYSTEM** |
| Uses liquid | Uses air |
| Closed circuit – liquid returns to tank | Open-ended circuit – air released to atmosphere |
| Requires small cylinders | Requires large cylinders |
| Higher system pressure | Lower system pressure |
| Slower operation | Faster operation |
| Self-lubricating | Requires lubrication |
| Suitable for fire risk areas | Dangerous for fire risk areas |
| High operating costs | Low operating costs |

10.1

(Any 3 × 2) (6)

10.2 10.2.1



10.2.2

10.2.3

10.2.4

10.2.5

(5 × 1) (5)

10.3 • Check the oil level in the compressor.

* Ensure that air supply is cool and clean. • Inspect the receiver for leakages. • Open drain valve to release any moisture.
* Make sure the intake filter is always clean.
* Check hoses and fittings for leaks and damage. Any (4 × 1) (4)

10.4 • Air is readily available

* Pneumatic equipment are very reliable
* Pneumatic systems are easily adapted • Compressed air is safer than electrical or hydraulic power
* Reciprocating motion is easily achieved in pneumatic systems
* Pneumatic systems can be easily adjusted to produce different speeds
* Installation and maintenance costs are low
* Can operate under harsh conditions (Any 5 × 1) (5)

**[20]**

# QUESTION 11

11.1 • To support long, slender workpieces between centres

* To maintain concentricity of long workpieces while machining
* To reduce vibration or chatter, ensuring better finish of the workpiece
* To support workpieces against the pressure of heavy machining

(Any 2 × 1) (2)

11.2 11.2.1 • Long tapers can be turned

* Cross-slide can be fed automatically (2 × 1) (2)

11.2.2 • Only external tapers can be turned

* As the centres are misaligned, uneven wear takes place

(2 × 1) (2)

11.3 11.3.1 Absolute dimensioning

11.3.2 Incremental dimensioning

(2 × 1) (2)

11.4 11.4.1 𝐷𝐷 − 𝑑𝑑 𝑙𝑙𝑆𝑆𝑙𝑙𝑙𝑙𝑆𝑆ℎ 𝑜𝑜𝑜𝑜 𝑤𝑤𝑜𝑜𝑜𝑜𝑤𝑤𝑤𝑤𝑤𝑤𝑆𝑆𝑤𝑤𝑆𝑆

𝑆𝑆𝑆𝑆𝑆𝑆 − 𝑜𝑜𝑜𝑜𝑆𝑆𝑜𝑜 = ×

2 𝑙𝑙𝑆𝑆𝑙𝑙𝑙𝑙𝑆𝑆ℎ 𝑜𝑜𝑜𝑜 𝑆𝑆𝑡𝑡𝑤𝑤𝑆𝑆𝑜𝑜

135 − 80 340

= × 

2 210

= 27,5 × 1,62

## = 44,55 mm  (2)

11.4.2 𝜃𝜃 𝑋𝑋

𝑆𝑆𝑡𝑡𝑙𝑙 =

2 𝐿𝐿 𝜃𝜃 27,5

## 2 210

𝑆𝑆𝑡𝑡𝑙𝑙 =

𝜃𝜃

𝑆𝑆𝑡𝑡𝑙𝑙 = 0,131 

2

𝜃𝜃 = 𝑆𝑆𝑡𝑡𝑙𝑙−1 0,131 × 2

## 𝜃𝜃 = 14,92° 𝑜𝑜𝑜𝑜 14° 55′ 

(3)

11.5 𝐿𝐿 = 𝑜𝑜 × 𝑁𝑁 × 𝑆𝑆

𝐿𝐿

𝑜𝑜 = 

## 𝑁𝑁 × 𝑆𝑆 𝑜𝑜 = 

𝑜𝑜 = 0,4 𝑚𝑚𝑚𝑚/𝑜𝑜𝑆𝑆𝑜𝑜  (3)

11.6 𝑆𝑆 = 𝜋𝜋DN

## = 𝜋𝜋 × 0,05 × 950  𝑆𝑆 = 149,23 𝑚𝑚/𝑚𝑚𝑤𝑤𝑙𝑙  (2)

11.7 • The lead of the screw thread

• The diameter of the screw thread (2 × 1) (2)

**[20]**

# QUESTION 12

12.1 12.1.1 A – Slitting saw

1. – Side and face cutter
2. – Slot drill
3. – End mill (4 × 1) (4)

12.1.2 A – Cutting material to length/cutting narrow grooves or slots

1. – Cut steps/cut slots
2. – Cut keyways/cut blind slots
3. – Milling slots/cutting profiles/facing narrow surfaces (4 × 1) (4)

12.2 𝑁𝑁

𝐼𝐼𝑙𝑙𝑑𝑑𝑆𝑆𝐼𝐼𝑤𝑤𝑙𝑙𝑙𝑙 =

## 9°

= 

= 7  2 6

= 7 × 

## 9 6

## = 7 

|  |  |
| --- | --- |
|   |  |
| 𝐼𝐼𝑙𝑙𝑑𝑑𝑆𝑆𝐼𝐼𝑤𝑤𝑙𝑙𝑙𝑙 = 7 𝑜𝑜𝑓𝑓𝑙𝑙𝑙𝑙 𝑆𝑆𝑓𝑓𝑜𝑜𝑙𝑙𝑡𝑡 𝑜𝑜𝑜𝑜 𝑆𝑆ℎ𝑆𝑆 𝑤𝑤𝑜𝑜𝑡𝑡𝑙𝑙𝑤𝑤 ℎ𝑡𝑡𝑙𝑙𝑑𝑑𝑙𝑙𝑆𝑆 𝑡𝑡𝑙𝑙𝑑𝑑 12 ℎ𝑜𝑜𝑙𝑙𝑆𝑆𝑡𝑡 𝑤𝑤𝑙𝑙 𝑡𝑡 54 ℎ𝑜𝑜𝑙𝑙𝑆𝑆 𝑤𝑤𝑤𝑤𝑜𝑜𝑤𝑤𝑙𝑙𝑆𝑆. | (5) |

12.3 12.3.1 It is a process in which a workpiece rotates so that a number of equally spaced divisions can be machined.

12.3.2 It is a slot that is drilled on a workpiece which does not go all the

way through to the other side of the workpiece

(2 × 1) (2)

12.4 • Reciprocating table

* Rotating table (2 × 1) (2)

12.5 • Coolant is dirty

* Dirt underneath the wheel guard
* Grinding wheel is too soft
* Incorrect wheel dressing
* Workpiece sliding off the magnetic chuck (Any 3 × 1) (3)

**[20]**

# TOTAL SECTION B: 40

**GRAND TOTAL:** **100**