basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

MECHANICAL TECHNOLOGY: FITTING AND MACHINING

MAY/JUNE 2024

MARKING GUIDELINES

MARKS: 200

These marking guidelines consist of 22 pages.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS (GENERIC)

1.1	A ✓	(1)
1.2	B ✓	(1)
1.3	A ✓	(1)
1.4	D ✓	(1)
1.5	C ✓	(1)
1.6	C ✓	(1)
		[6]

QUESTION 2: SAFETY (GENERIC)

2.1 **First aid:**

- When illness occurs. ✓
- When an injury is sustained. ✓
- When an accident occurs. ✓

(Any 2 x 1) (2)

2.2 **Bench grinder:**

A. A fire extinguisher should be readily available. ✓
B. Safety glasses must be worn. ✓
C. Maximum grinding wheel speed. ✓
D. Maximum distance between tool rest and grinding wheel. ✓ (4)

2.3 **Drill press:**

- Never try to stop/hold the work piece by hand when the drill bit get stuck during drilling. ✓
- Don't force a drill bit into the work piece. ✓
- Keep loose clothing and hair away from revolving parts. ✓
- Never leave the machine running if it is unattended. ✓
- Use a brush or wooden rod to remove chips from the drill. ✓
- Do not put hands near moving parts. ✓
- Never clean or adjust the machine while it is in motion. ✓
- Never try to stop the drill/chuck by hand. ✓

(Any 2 x 1) (2)

2.4 **Surface grinder:**

- Never clean or adjust the machine while it is in motion. ✓
- Know how to stop the machine in an emergency. ✓
- Do not use excessive force when grinding the work piece. ✓
- Immediately report any dangerous defects of the machine. ✓
- Stop using defective machinery until it has been repaired by a qualified person. ✓
- Ensure that the grinding wheel is not submerged in coolant. ✓
- Never leave the machine running if it is unattended. ✓
- Do not put hands near moving parts. ✓

(Any 2 x 1) (2)
[10]

QUESTION 3: MATERIALS (GENERIC)

3.1 **Critical temperature:**

3.1.1 **Hardening:**
Above ✓ (1)

3.1.2 **Tempering:**
Below ✓ (1)

3.1.3 **Normalising:**
Above ✓ (1)

3.2 **Machining test:**

- The chips heating colour ✓
- The chips curl ✓ (2)

3.3 **Material tests:**

- Sound test ✓
- Bending test ✓
- Filing test ✓
- Hardness test ✓
- Density test ✓
- Weight measurement ✓
- Magnetic test ✓
- Visual inspection/observation ✓
- Scratch test ✓

(Any 3 x 1) (3)

3.4 **Quenching methods:**

- Carburising ✓
- Nitriding ✓
- Cyaniding ✓

(Any 2 x 1) (2)

3.5 **Heat treatment temperature:**

- Pyrometer ✓
- Crayons ✓
- Visually ✓
- Magnet ✓

(Any 1 x 1) (1)

3.6 **Heat-treatment steps:**

- Heat the metal. ✓
- Soak the metal. ✓
- Cool the metal. ✓ (3)

[14]

QUESTION 4: MULTIPLE-CHOICE QUESTIONS (SPECIFIC)

4.1	B ✓	(1)
4.2	C ✓	(1)
4.3	B ✓	(1)
4.4	C ✓	(1)
4.5	D ✓	(1)
4.6	D ✓	(1)
4.7	C ✓	(1)
4.8	A ✓	(1)
4.9	B ✓	(1)
4.10	A ✓	(1)
4.11	B ✓	(1)
4.12	A ✓	(1)
4.13	A ✓	(1)
4.14	D ✓	(1)
		[14]

QUESTION 5: TERMINOLOGY (LATHE AND MILLING MACHINE) (SPECIFIC)

5.1 **Advantages of tailstock set-over method:**

- The automatic feed of the machine can be used. ✓
- Good finish. ✓
- Long tapers can be cut. ✓
- Accurate tapers can be cut. ✓
- Experience less operator fatigue. ✓

(Any 2 x 1) (2)

5.2 **Taper calculations:**

5.2.1 **Tool:**
Boring bar. ✓ (1)

5.2.2 **Diameter of taper:**

$$\tan\frac{\theta}{2} = \frac{D - d}{2 \times l}$$

$$\tan\frac{7}{2} ✓ = \frac{46 - d}{2 \times 155} ✓✓$$

$$310 \tan 3{,}5^\circ ✓ = 46 ✓ - d$$

$$d = 46 - 18{,}96$$

$$d = 27{,}04 \text{ mm} ✓$$

OR

$$\tan 3{,}5 = \frac{x}{155} ✓$$

$$x = \tan 3{,}5 \times 155 ✓$$

$$= 9{,}46 \text{ mm} ✓$$

$$d = 46 - 2x ✓$$

$$= 46 - 2(9{,}46) ✓$$

$$= 27{,}04 \text{ mm} ✓$$

(6)

5.3 **Calculation of parallel key:**

5.3.1

$$\text{Width} = \frac{D}{4}$$

$$= \frac{82}{4} ✓$$

$$= 20{,}50 \text{ mm} ✓$$

(2)

5.3.2

$$\text{Thickness} = \frac{D}{6}$$

$$= \frac{82}{6} ✓$$

$$= 13{,}67 \text{ mm} ✓$$

(2)

5.3.3 $\text{Lenght} = 1,5 \times \text{diameter of shaft}$
$= 1,5 \times 82$ ✓
$= 123 \text{ mm}$ ✓ (2)

5.4 **Advantages of gang milling:**

- Several surfaces can be milled simultaneously. ✓
- Saving time. ✓
- Makes production more effective. ✓
- Fewer cutters need to be changed. ✓

(Any 3 x 1) (3)
[18]

QUESTION 6: TERMINOLOGY (INDEXING) (SPECIFIC)

6.1 **Gear calculations:**

6.1.1 **Number of teeth:**

$$\text{Module} = \frac{PCD}{T}$$

$$T = \frac{PCD}{m} \checkmark$$

$$= \frac{156}{3} \checkmark$$

$$= 52 \text{ teeth} \checkmark$$

(3)

6.1.2 **Dedendum:**

$$\text{Dedendum} = 1{,}157(m)$$
$$= 1{,}157 \times 3 \checkmark$$
$$= 3{,}47 \text{ mm} \checkmark$$

OR

$$= 1{,}25(m)$$
$$= 1{,}25 \times 3 \checkmark$$
$$= 3{,}75 \text{ mm} \checkmark$$

(2)

6.1.3 **Outside diameter:**

$$OD = PCD + 2(m)$$
$$= 156 + 2(3) \checkmark$$
$$= 162 \text{ mm} \checkmark$$

OR

$$= m(T + 2)$$
$$= 3(52 + 2) \checkmark$$
$$= 162 \text{ mm} \checkmark$$

(2)

6.1.4 **Circular pitch:**

$$CP = m \times \pi$$
$$= 3 \times \pi \checkmark$$
$$= 9{,}42 \text{ mm} \checkmark$$

(2)

6.2 **Dove tail calculations:**

W = 145 + 2(DE)

m = W - 2 (AC) - 2 (R) **or** m = W - 2 (AC +R)

6.2.1 **Maximum width of dove tail (W):**

Calculate DE:

$$\tan\alpha = \frac{DE}{AD} \ ✓$$
$$DE = AD\tan\alpha \ ✓$$
$$= 32\tan 30°$$
$$= 18{,}48 \text{ mm} \ ✓$$

OR

$$\tan\theta = \frac{AD}{DE} \ ✓$$
$$\tan 60° = \frac{AD}{DE} \ ✓$$
$$DE = \frac{32}{\tan 60°}$$
$$= 18{,}48 \text{ mm} \ ✓$$

$$W = 145 + 2(DE) \ ✓$$
$$= 145 + 2(18{,}48) \ ✓$$
$$= 145 + 36{,}96$$
$$= 181{,}96 \text{ mm} \ ✓$$

(6)

6.2.2 **Distance between the rollers (m):**

Calculate AC:

$$\tan\alpha = \frac{BC}{AC} \ ✓$$
$$AC = \frac{BC}{\tan\alpha} \ ✓$$
$$= \frac{12}{\tan 30°}$$
$$= 20{,}78 \text{ mm} \ ✓$$

OR

$$\tan\theta = \frac{AC}{BC} \ ✓$$
$$AC = BC\tan 60° \ ✓$$
$$= 12\tan 60°$$
$$= 20{,}78 \text{ mm} \ ✓$$

$$m = W - 2(AC) - 2(R) \ ✓$$
$$= 181{,}96 - 2(20{,}78) - 2(12) \ ✓$$
$$= 181{,}96 - 41{,}56 - 24$$
$$= 116{,}40 \text{ mm} \ ✓$$

OR

$$m = W - 2(AC + R) \ ✓$$
$$= 181{,}96 - 2(20{,}78 + 12) \ ✓$$
$$= 181{,}96 - 65{,}56$$
$$= 116{,}40 \text{ mm} \ ✓$$

(6)

6.3 **Milling of spur gear:**

6.3.1 **Indexing:**

$$\text{Indexing} = \frac{40}{n}$$

$$\text{Indexing} = \frac{40}{A}$$

$$= \frac{40}{160} \checkmark$$

$$= \frac{1}{4} \times \frac{6}{6}$$

$$= \frac{6}{24} \checkmark$$

Approximate indexing:

No full turns and 6 holes on a 24-hole circle ✓

OR

No full turns and 7 holes on a 28-hole circle ✓ (3)

6.3.2 **Change gears:**

$$\frac{D_{DR}}{D_{DN}} = (A - n) \times \frac{40}{A}$$

$$\frac{D_{DR}}{D_{DN}} = (160 - 163) \times \frac{40}{160} \checkmark$$

$$= -3 \times \frac{40}{160}$$

$$= \frac{-120}{160}$$

$$= \frac{3}{4} \times \frac{8}{8} \checkmark$$

$$\frac{D_{DR}}{D_{DN}} = \frac{24 \checkmark}{32 \checkmark}$$

(4)
[28]

QUESTION 7: TOOLS AND EQUIPMENT (SPECIFIC)

7.1 **Define hardness:**
Hardness is a material's ability to resist deformation, ✓ usually by indentation/penetration/scratching. ✓ (2)

7.2 **Hardness testers:**

- Brinell hardness tester ✓
- Rockwell hardness tester ✓
- Vickers hardness tester ✓

(Any 2 x 1) (2)

7.3 **Microscope:**

To measure ✓ the diameter/depth of the indentation ✓ left in the test material. (2)

7.4 **Tester:**

7.4.1 Tensile tester ✓ (1)

7.4.2 Hand wheel ✓ (1)

7.5 **Hardness tester:**

Rockwell hardness tester ✓ (1)

7.6 **Moment and Force:**

Test the reaction ✓ on either side of simply loaded beam. ✓ (2)

7.7 **Reading:**

2,00 + 0,40 + 0,5 = 2, 90 mm ✓ ✓

(2)
[13]

QUESTION 8: FORCES (SPECIFIC)

8.1 **Forces:**

8.1.1 **Horizontal components:**

$$\sum HC = 75\cos 35° - 15\cos 45° - 5\cos 0° - 45\cos 60°$$

$$\sum HC = 61{,}44 ✓ - 10{,}61 ✓ - 5 ✓ - 22{,}5 ✓$$

$$\sum HC = 23{,}33 \text{ N} ✓$$

(5)

8.1.2 **Vertical components:**

$$\sum VC = 75\sin 35° + 15\sin 45° - 5\sin 0° - 45\sin 60°$$

$$\sum VC = 43{,}02 ✓ + 10{,}61 ✓ - 0 - 38{,}97 ✓$$

$$\sum VC = 14{,}66 \text{ N} ✓$$

(4)

OR

Force	***θ***	8.1.1 **∑HC/x = Fcosθ**		8.1.2 **∑VC/y = Fsinθ**	
25 N	90º	HC = 75cos35°	61,44 N ✓	VC = 75sin35°	43,02 N ✓
40 N	0º	HC = 15cos135°	10,61 N ✓	VC = 15sin135°	10,61 N ✓
55 N	290º	HC = 5cos180°	-5 N ✓	VC = 5sin180°	0 N
120 N	210º	HC = 45cos240°	-22,5 N ✓	VC = 45sin240°	-38,97 N ✓
		Total	**23,33 N** ✓		**14,66 N** ✓

(9)

8.1.3 **Resultant:**

$$R^2 = VC^2 + HC^2$$

$$R = \sqrt{(14{,}66)^2 + (23{,}33)^2} ✓$$

$$R = \sqrt{759{,}20}$$

$$R = 27{,}55\text{N} ✓$$

(2)

8.1.4 **Angle and direction of resultant:**

Angle:

$$\tan\theta = \frac{VC}{HC}$$

$$\theta = \tan^{-1}\left(\frac{14,66}{23,33}\right) \checkmark$$

$$\theta = \tan^{-1}(0,63)$$

$$\theta = 32,14° \checkmark$$

OR

$$\tan\theta = \frac{HC}{VC}$$

$$\theta = \tan^{-1}\left(\frac{23,33}{14,66}\right) \checkmark$$

$$\theta = \tan^{-1}(1,59)$$

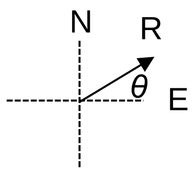
$$\theta = 57,86° \checkmark$$

Direction:

$R = 27,55\text{ N }\ 32,14°$ North of East ✓

OR

$R = 27,55\text{ N }\ 57,86°$ East from North



(3)

8.2 **UDL Beam:**

8.2.1 **Distributed load:**

Uniform distributed load:

$$UDL = 15 \times 6 \checkmark$$
$$= 90\text{ N} \checkmark$$

(2)

8.2.2 **Reaction in support A:**

Take moments about B:

$$(160 \times 2,5)\checkmark + (90 \times 7)\checkmark + (55 \times 14)\checkmark = (A \times 14)$$

$$400 + 630 + 770 = 14A$$

$$A = \frac{1800}{14}$$

$$A = 128,57\text{N} \checkmark$$

Reaction in support B:

Take moments about A:

$$(B \times 14) = (55 \times 0) + (90 \times 7)\checkmark + (160 \times 11,5)\checkmark$$

$$14B = 0 + 630 + 1840$$

$$B = \frac{2470}{14}$$

$$B = 176,43\text{ N} \checkmark$$

(7)

8.3.1 **Diameter:**

$$\sigma = \frac{F}{A}$$

$$A = \frac{F}{\sigma} \checkmark$$

$$A = 3{,}19 \times 10^{-4}$$

$$\frac{\pi d^2}{4} = 3{,}19 \times 10^{-4} \checkmark$$

$$\pi \times d^2 = 1{,}28 \times 10^{-3}$$

$$\sqrt{d^2} = \sqrt{4{,}06 \times 10^{-4}} \checkmark$$

$$d = 0{,}02015 \text{ m}$$

$$d = 20{,}15 \text{ mm} \checkmark$$

OR

$$A = \frac{\pi \times d^2}{4}$$

$$d = \sqrt{\frac{4A}{\pi}} \checkmark \checkmark$$

$$d = \sqrt{\frac{4 \times (3{,}19 \times 10^{-4})}{\pi}} \checkmark$$

$$= 0{,}02015 \text{ m}$$

$$= 20{,}15 \text{ mm} \checkmark$$

(4)

8.3.2 **Change in length:**

$$E = \frac{\sigma}{\varepsilon}$$

$$\varepsilon = \frac{\sigma}{E} \checkmark$$

$$\varepsilon = \frac{56{,}5 \times 10^6}{90 \times 10^9} \checkmark$$

$$\varepsilon = 6{,}28 \times 10^{-4} \checkmark$$

$$\varepsilon = \frac{\Delta L}{oL}$$

$$\Delta L = \varepsilon \times oL \checkmark$$

$$\Delta L = 6{,}28 \times 10^{-4} \times 0{,}275 \checkmark$$

$$\Delta L = 1{,}73 \times 10^{-4} \text{ m}$$

$$\Delta L = (1{,}73 \times 10^{-4}) \times 1000$$

$$\Delta L = 0{,}17 \text{ mm} \checkmark$$

(6)
[33]

QUESTION 9: MAINTENANCE (SPECIFIC)

9.1 **Preventative maintenance:**

- Checking for wear and tear on belt. ✓
- Checking belt alignment. ✓
- Checking the tensioning devices. ✓
- Checking the tensioning setting. ✓
- Make sure all guards are in place. ✓
- Checking for dirt on belt and pulleys. ✓

(Any 4 x 1) (4)

9.2 **High power drives:**

- Gear drive ✓
- Multiple belt drives ✓
- Tooth belt drives ✓
- Chain drives ✓

(Any 2 x 1) (2)

9.3 **Bonding methods:**

- Plastic welding (heat) ✓
- Adhesive/PVC-Weld ✓ (2)

9.4 **Uses of the materials:**

9.4.1 **Nylon:**

- Pulleys ✓
- Ropes ✓
- Bushes ✓
- Gears ✓
- Wear pads ✓
- Wheels ✓
- Rollers ✓
- Gaskets ✓
- Seals ✓
- Machinery parts ✓

(Any 2 x 1) (2)

9.4.2 **Fibreglass:**

- Machine covers ✓
- Roof covering ✓
- Woven cloth ✓

(Any 2 x 1) (2)

9.4.3 **Bakelite uses:**

- Circuit boards ✓
- Electrical components ✓
- Electrical insulators ✓
- Kitchenware ✓
- Jewellery ✓
- Pipe stems ✓
- Toys ✓
- Distributor rotor ✓
- Distributor cap ✓
- Aircraft components ✓
- Bearings ✓
- Clutch linings ✓
- Brake linings ✓
- Laminated materials ✓

(Any 2 x 1) (2)

9.5 **Thermo-hardened/Thermosetting or Thermoplastic composite:**

9.5.1 Thermoplastic ✓ (1)

9.5.2 Thermo-hardened / Thermosetting ✓ (1)

9.5.3 Thermo-hardened / Thermosetting ✓ (1)

9.5.4 Thermoplastic ✓ (1)

[18]

QUESTION 10: JOINING METHODS (SPECIFIC)

10.1 **Uses of multiple threads:**

- Fire hydrants ✓
- Valves ✓
- Aircraft landing gear ✓
- Industrial machines ✓
- Lids of containers/jars ✓
- Fly press ✓

(Any 3 x 1) (3)

10.2 **Multiple screw threads:**

- They provide more bearing surface. ✓
- Do not strip easily. ✓
- To provide faster linear movement. ✓
- They are more efficient. ✓
- They lose less power to friction. ✓

(Any 3 x 1) (3)

10.3 **Square Thread:**

10.3.1 **Pitch:**

$$\text{Pitch} = \frac{\text{Lead}}{\text{Number of starts}}$$

$$= \frac{46}{2} \checkmark$$

$$= 23 \text{ mm} \checkmark$$

(2)

10.3.2 **Pitch diameter:**

$$D_m = OD - \frac{P}{2}$$

$$= 80 - \frac{23}{2} \checkmark$$

$$= 68,50 \text{ mm} \checkmark$$

(2)

10.3.3 **Helix angle of the thread:**

$$\tan\theta = \frac{\text{Lead}}{\pi \times D_M}$$

$$= \frac{46}{\pi \times 68,50} \checkmark$$

$$\theta \overset{\checkmark}{=} \tan^{-1}(0,213755\overset{\checkmark}{5}44)$$

$$= 12,07° \quad \text{or} \quad 12°4' \checkmark$$

(4)

10.3.4 **Leading tool angle:**

$$\begin{aligned}\text{Leading tool angle} &= 90° - (\text{helix} + \text{clearance angle}) \\ &= 90° - (12{,}07° + 3°)\ ✓ \\ &= 74{,}93° \quad \text{or} \quad 74°55'\ ✓\end{aligned}$$

(2)

10.3.5 **Following tool angle:**

$$\begin{aligned}\text{Following tool angle} &= 90° + (\text{helix} - \text{clearance angle}) \\ &= 90° + (12{,}07° - 3°)\ ✓ \\ &= 99{,}07° \quad \text{or} \quad 99°4'\ ✓\end{aligned}$$

(2)

[18]

QUESTION 11: SYSTEMS AND CONTROL (DRIVE SYSTEMS) (SPECIFIC)

11.1 **Hydraulic calculations:**

11.1.1 **The fluid pressure in the hydraulic system in MPa:**

$$A\ (\text{Plunger}) = \frac{\pi d^2}{4}$$

$$A = \frac{\pi(0{,}03)^2}{4}\ \checkmark$$

$$A = 0{,}71 \times 10^{-3}\ \text{m}^2\ \checkmark$$

$$P = \frac{F}{A}$$

$$P = \frac{900\ \checkmark}{0{,}71 \times 10^{-3}\ \checkmark}$$

$$P = 1{,}27 \times 10^{6}\ \text{Pa}$$

$$P = 1{,}27\ \text{MPa}\ \checkmark$$

(5)

11.1.2 **Mass in kg:**

$$\frac{F_A}{A_A} = \frac{F_B}{A_B}$$

$$F_B = \frac{F_A \times A_B}{A_A}\ \checkmark$$

$$F_B = \frac{900 \times 31{,}42 \times 10^{-3}\ \checkmark}{0{,}71 \times 10^{-3}\ \checkmark}$$

$$F_B = 39828{,}17\ \text{N}$$

$$\text{Mass} = 3982{,}82\ \text{kg}\ \ \textbf{OR}\ \ 4059{,}96\ \text{kg}\ \checkmark$$

(4)

11.2 **Function of hydraulic components:**

11.2.1 **Motor**
Drives the hydraulic pump. ✓ (1)

11.2.2 **One-way-valve**
To prevent backflow of hydraulic fluid. ✓ (1)

11.2.3 **Reservoir**
Contains the hydraulic fluid. ✓ (1)

11.3 **Belt drive:**

11.3.1 **The rotational frequency in r/sec:**

$$N_{DR} \times D_{DR} = N_{DN} \times D_{DN}$$
$$N_{DR} = \frac{N_{DN} \times D_{DN}}{D_{DR}} \checkmark$$
$$N_{DR} = \frac{5,83 \times 0,5}{0,09} \checkmark$$
$$N_{DR} = \frac{2,92}{0,09}$$
$$N_{DR} = 32,39 \text{ r/sec} \checkmark$$

OR

$$N_{DR} \times D_{DR} = N_{DN} \times D_{DN}$$
$$N_{DR} = \frac{N_{DN} \times D_{DN}}{D_{DR}} \checkmark$$
$$N_{DR} = \frac{350 \times 500}{90} \checkmark$$
$$N_{DR} = \frac{1944,44 \text{ r/min}}{60}$$
$$N_{DR} = 32,41 \text{ r/sec} \checkmark$$

(3)

11.3.2 **Power transmitted in Watt:**

$$P = \frac{(T_1 - T_2)\, \pi\, D\, N}{60}$$

$$P = (1900 \overset{\checkmark}{-} 450)\, \pi \times \overset{\checkmark}{0,09} \times \overset{\checkmark}{32,39}$$

$$P = 13279,18 \text{ W } \checkmark$$

OR

$$P = \frac{(T_1 - T_2)\, \pi\, D\, N}{60}$$

$$P = (1900 \overset{\checkmark}{-} 450)\, \pi \times \overset{\checkmark}{0,5} \times \overset{\checkmark}{5,83}$$

$$P = 13278,73 \text{ W } \checkmark$$

OR

$$P = \frac{(T_1 - T_2)\, \pi\, D\, N}{60}$$

$$P = (1900 \overset{\checkmark}{-} 450)\, \pi \times \overset{\checkmark}{0,5} \times \overset{\checkmark}{350}$$

$$P = 13286,32 \text{ W } \checkmark$$

(4)

11.4 **Avoid slipping:**

- Adding a belt tensioning device. ✓
- Not subjected to sudden loads. ✓
- Do not overload the drive. ✓
- Cover the drives to guard against dust and fluids. ✓
- Increase the contact area of the belts. ✓
- Use toothed belts and pulleys. ✓ (2)

(Any 2 x 1)

11.5 **Gear drive:**

11.5.1 **Number of teeth:**

$$\frac{N_{input}}{N_{output}} = \frac{\text{Product of teeth on driven gears}}{\text{Product of teeth on driver gears}}$$

$$\frac{N_A}{N_D} = \frac{T_B \times T_D}{T_A \times T_C}$$

$$T_D = \frac{N_A \times T_A \times T_C}{N_D \times T_B} \checkmark$$

$$T_D = \frac{3500 \times 33 \times 25}{1050 \times 55} \checkmark$$

$$T_D = 50 \text{ teeth} \checkmark$$

(3)

11.5.2 **Torque:**

$$P = \frac{2\,\pi\,N\,T}{60}$$

$$T = \frac{P \times 60}{2 \times \pi \times N} \checkmark$$

$$T = \frac{(737{,}4 \times 10^3) \times 60}{2 \times \pi \times 1050} \checkmark$$

$$T = 6706{,}33 \text{ Nm} \checkmark$$

OR

$$P = 2\,\pi\,N\,T$$

$$T = \frac{P}{2 \times \pi \times N} \checkmark$$

$$T = \frac{(737{,}4 \times 10^3)}{2 \times \pi \times 17{,}5} \checkmark$$

$$T = 6706{,}33 \text{ Nm} \checkmark$$

(3)
[28]

TOTAL: 200