Solution with marking scheme
Paper code:- 4359-154(T1) October 2019 / In sem (T1-).
T.Y.B.Tech (Mechanical)
Course - Manufacturing Technology
MEUA31174

Q4 1 (a) According to the Lee and Shaffer eq^n.

$$\phi = 45^\circ - \tan^{-1}(0.5) + 0 = 18.43^\circ$$

Then

$$F_S = \frac{2 \times 0.25 \times 400 \times 10^6}{\sin 18.43^\circ \times 10^6}$$

$$= 632.6\ N$$ ——— 1 marks

from eq^n $R = \frac{F_S}{\cos(\phi + \lambda - \alpha)}$ &

$$F_C = R \cos(\lambda - \alpha)$$

we get $F_C = 800\ N$

$$r = \frac{\sin\phi}{\cos(\phi - \alpha)} = 0.333$$

Again $F_T = F_C \tan(\lambda - \alpha) = 400\ N$

$$W_P = (F_C V - F_r V) = 1333\ W$$ — 1 marks

$$W_S = F_r V = 266.7\ W$$

~~Correct cap~~ ~~correction~~ $\theta = \frac{\rho c v t_i}{k}$ k - thermal conductivity

$$= \frac{7200 \times 502 \times 2 \times 0.25 \times 10^{-3}}{43.6}$$

$$= 41.5$$

$\therefore \Theta \tan\phi = 41.5 \times 0.333 = 13.8$ ——— 1 marks

$$\Theta_p = \frac{(1-\beta)\, w_p}{e \times c \times v \times t_1 \times w}$$

$$\therefore \beta = 0.15 \ln\left(\frac{27.5}{\Theta \tan\phi}\right)$$

$$= 0.15 \ln\left(\frac{27.5}{13.8}\right)$$

$= 0.1$ ——— 1 marks.

$$\therefore \Theta_p = \frac{(1-0.1) \times 1333 \times 10^3 \times 10^3}{7200 \times 502 \times 2 \times 0.25 \times 2}$$

$= 332^\circ C$ ——— 2 marks.

Qu 1 b) $V = 10$ m/min

$D = 8$ mm

$L = 10$ mm

$f = 0.1$ mm/rev

$$N = \frac{V \times 1000}{\pi D} = \frac{10 \times 1000}{\pi \times 8} = 398 \text{ rpm}$$

Time take for one hole $= \frac{L}{f \times N} = 0.25$ mi

for four holes $= 1$ min ——— 1 marks

*Time to drill one hole of 40 diameter

@ Drill 20 mm hole → 30 mm long.

$$V = \frac{\pi D N}{1000} \Rightarrow N = \frac{153}{80} \text{ rpm}$$

$$\therefore \text{Time} = \frac{L}{} = \frac{30}{} = 0.95$$

(b) Enlarge 20 mm hole with 40 mm drill

$$N = \frac{10 \times 1000}{\pi \times 40} = 80 \text{ rpm}$$

$$f = 0.4 \text{ mm/rev.}$$

$$\text{Time taken} = \frac{30}{0.4 \times 80} = 0.94 \text{ approx min.}$$ — 2 marks

Total time taken to drill all the holes

$$= 1.0 + 0.95 + 0.94$$

$$= 2.9 \text{ min.}$$ — 1 mark

Qu 1 (c)

$D = 10 \text{ cm} = 100 \text{ mm}$

$V = 50 \text{ m/min}$

$f = 5 \text{ cm/min} = 50 \text{ mm/min}$

$L = 20 \text{ cm} = 200 \text{ mm}$

$W = 5 \text{ cm} = 50 \text{ mm}.$

$$N = \frac{V \times 1000}{\pi \times D} = \frac{1000 \times 50}{\pi \times 100} = 160 \text{ rpm}$$ — 1 mark

$$\text{feed/min} = f_t \times Z \times N$$

$$50 \text{ mm/min} = f_t \times 16 \times 160$$

$$f_t = 0.0196 \text{ mm}$$ — 1 mark

$$\text{Milling Time} = \frac{L + \frac{1}{2}\left[D - \sqrt{D^2 - W^2}\right]}{f_t \times Z \times N}$$

$$= \frac{200 + \frac{1}{2}\left[100 - \sqrt{100^2 - 50^2}\right]}{0.0196 \times 16 \times 160}$$

$$= 4.14 \text{ min.}$$ — 2 marks

Q42 (a) $V = 15$ m/min.

Length of stroke L = Length of plate + clearance on both sides

$= 1200 + 2 \times 25$

$= 1250$ mm

Cross travel W = width of job + clearance

$= 600 + 2 \times 15$

$= 630$ mm.

$$K = \frac{2}{3} = \frac{t_r}{t_c}$$

Crossfeed for rough cut = 2 mm/stroke

Crossfeed for finish cut = 1 mm/stroke

Time for complete one stroke $= t_c + t_r$

$= 0.12$ min — 2 marks

No. of stroke for roughing $= \frac{630}{2} = 315$ } 2 marks

No. of stroke for finishing $= \frac{630}{1} = 630$ }

Total no. of stroke $= 315 + 630 = 945$

Total milling time $= (t_c + t_r) \cdot$ no. of stroke

$= 0.12 \times 945$

$= 113.4$ min. — 2 marks

Q42 (b)

$T_1 = 150$ min, $V_1 = 20$ m/min

$T_2 = 25.2$ min, $V_2 = 25$ m/min

$K_2 = 10 K_1$, $T_c = 2$ min.

By eqn $VT^n = C$

$V_1 T_1^n = V_2 T_2^n$

$\left(\frac{T_1}{T_2}\right)^n = \left(\frac{V_2}{V_1}\right)$

$$n = \frac{\log(V_2/V_1)}{\log(T_1/T_2)}$$

$$= \frac{\log(25/20)}{\log(150/25.2)}$$

$$n = \frac{0.223}{1.783}$$

$$n = 0.125 \quad \text{— 2 marks}$$

$V_1 T_1^n = C$ or

$V_2 T_2^n = C$.

$\therefore 20 \times 150^{0.125} = C$

$C = 37.417$

i) Vmp (Economical speed for max. production)

$$Vmp = \frac{C}{\left[\left(\frac{1}{n} - 1\right) TC\right]^n} = \frac{37.417}{\left[\left(\frac{1}{0.125} - 1\right) 2\right]^{0.125}}$$

$= 26.903$ m/min — 2 marks

ii) Tmp (for max. prodn tool life is

$$= \left(\frac{1}{n} - 1\right) TC$$

$$= \left(\frac{1}{0.125} - 1\right) \times 2$$

$Tmp = 14$ min. 2 marks

Qu 2 (c)

Minimum 4 points & sketch (4 marks)

Qu 3 (a).

Neat sketch each carry 1 marks (1×2) = 2 marks

Explaination of Truing 2 marks

Explaination of Dressing 2 marks.

Qu 3 (b) sketch – 2 marks

Explaination – 2 marks.

Qu 3 (c)

Where

26 – Manufacturer's prefix for Abrasive (½ marks

C – Abrasive type (silicon carbide) (

60 – medium grain size (½ mark

en – medium grade (½ mark

7 – open structure (½ mark

V – Vitrified bond (1 mark

28 – Manufacturer's symbol (½ ma

Qu 4 (a) sketch – 1 mark

Construction – 2 marks

working – 2 marks

Advantage & disadvantage – 1 mark.

Q4 (b)

W – Manufacturer's prefix
A – Abrasive type (Aluminium oxide)
40 – Medium size
J – Soft grade
6 – Dense structure
V – Vitrified bond
17 – Manufacturer's bond type

2 marks

2 marks.

Q4 (c)

Sketch one (01) marks each

Each point carry 1 marks