Unit 4 - Week 2

Assignment 2

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2020-02-12, 23:59 IST.

1) 1 point

In an experiment carried out in USM, as the static load increases

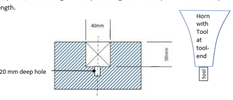
a. The MRR increases and then decreases
b. The MRR decreases and then increases
c. The MRR monotonically increases
d. None of these

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

2) 1 point

You are running one USM facility and a client brings a glass set-up (shown) in which a 20 mm deep hole has to be drilled by USM in glass at the bottom floor of the square blind hole. You have a circular cross section horn with exponentially decaying cross sectional area. The transducer-end dia of horn is ϕ200 mm with area A_0 and its tool-end dia is ϕ30 mm with area A_1. Tool for drilling with protrusion length 20 mm is fitted to the tool-end of the horn. Velocity of sound in the horn material is 5000m/s and applied frequency is 20,000 Hz. Length of the protruding tool is exactly 20 mm and is not part of horn length.



The length of the horn (without the tool) is nearest to (within ± 3 mm)

a. 123 mm
b. 146 mm
c. 159 mm
d. Not near any of these by ±3 mm

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

3) 1 point

The horn, with the correct length, as obtained from the above mentioned problem, fitted with 20 mm protruding tool,

a. Will get obstructed at the opening of the square blind hole after partially drilling the 20 mm deep hole
b. Will be able to completely drill the 20 mm deep hole at the bottom of the square hole
c. Will get obstructed at the opening of the square blind hole even before starting to drill the 20 mm deep hole
d. None of these

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
c.

4) 1 point

You are selecting the horn of a USM machine in which the cross sectional area would be exponentially reducing from transducer end to tool end. The speed of sound in different materials is listed in m/s.

Material for horn	Speed of sound in m/s
Mild Steel	6100
Stainless steel	5790
Titanium	6070
Duralumin	6320

The material, that would yield the shortest length of horn, is

a. Titanium
b. Stainless steel
c. Mild steel
d. Duralumin

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

5) 1 point

If the static load is increased in USM, the surface finish of a glass work piece

a. Will show improvement for higher static load
b. Will show deterioration for higher static load
c. Will first improve and then deteriorate with increase in static load
d. None of these

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
a.

6) 1 point

A glass manufacturing company produces a variety of window glass in which the hardness varies as

$$H = H_0 \times e^{-\alpha z}$$

Where H_0 = Hardness at the outer surface of the glass at $z = 0$, α is a constant greater than 0

Assume $(H_0/H_T) \times e^{-\alpha t} >> 1$ for $0 \le z \le t$, where t = thickness of glass and H_T = hardness of tool

A testing agency tries to drill a hole in that window glass with an ultrasonic drilling machine, starting from outside surface of glass. The time required to drill to a depth z will contain the term

a. $1 - e^{-0.75\alpha z}$
b. $1 - e^{-0.75\alpha z}$
c. $1 - e^{-1.5\alpha z}$
d. None of these

a.
b.
c.
d.

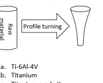
No, the answer is incorrect.
Score: 0
Accepted Answers:
c.

7) 1 point

A machine designer is assigned by his company to reduce price of their USM drilling machine. The machine employs a circular cross section Horn which should have N = 5 (Area ratio) and transducer end diameter as 100 mm. The material can either be pure Titanium or Ti-6Al-4V or Titanium Grade X.

Material for horn	Speed of sound in m/s	Rs/kg
Ti-6Al-4V	4987	Rs 2000/-
Pure Titanium	6070	Rs 1300/-
Titanium Grade X	4200	Rs 3200/-

In such a case, if the frequency employed is 20 kHz, and if the raw material for the horn is a cylindrical bar with diameter = ϕ 102 mm, the raw material cost for the horn would be lowest for the following material



a. Ti-6Al-4V
b. Titanium
c. Titanium grade X

a.
b.
c.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

8) 1 point

The main advantage of die sinking USM (X) over die sinking EDM (Y) is that

a. X can drill non-circular cross section holes while Y cannot
b. X can drill hard brittle electrically non-conductive materials while Y cannot
c. X has no running costs while Y has huge running costs
d. None of these

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

9) 1 point

The MRR in Die-sinking USM of a brittle material

a. Varies inversely with the average grit size of the abrasives in the slurry
b. Varies directly with the average grit size of the abrasives in the slurry
c. Is not affected by the average grit size of the abrasives in the slurry
d. None of these

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
b.

10) 1 point

Action of abrasive grits in USM and in conventional grinding can be comparatively stated as

a. The material removal mechanism in USM and conventional grinding is one and the same
b. In USM, the grits move roughly tangential to the work piece surface while in conventional grinding, the grits move normal to the work piece surface
c. In USM, the grits move normal to the work piece surface while in conventional grinding, the grits move roughly tangential to the work piece surface
d. None of these

a.
b.
c.
d.

No, the answer is incorrect.
Score: 0
Accepted Answers:
c.