Total No. of printed pages = 4

ME 181604

19/6/23

Roll No. of candidate | | | | | | | | | | |

2023

B.Tech. 6th Semester End-Term Examination

Mechanical Engineering

WORKSHOP THEORY AND PRACTICE – II

(New Regulation (w.e.f 2017 – 18) & New Syllabus (w.e.f. 2018 – 19))

Full Marks – 70 Time – Three hours

The figures in the margin indicate full marks for the questions.

Answer Question No. 1 and any *four* from the rest.

1. Choose the correct answer for the following objective type questions : $(10 \times 1 = 10)$

(i) Projection welding is _____.

(a) Multi-spot welding process

(b) Continuous spot welding process

(c) Used to form mesh

(d) Used to make cantilevers

(ii) Submerged arc welding is _____.

(a) A process which uses a mixture of iron oxide and granular aluminium

(b) Accomplished by maintaining a hot molten metal pool between plates

(c) A process in which arc is maintained under a blanket of flux

(d) None of the above

(iii) Arc stability is better with _____.

(a) AC welding (b) DC welding

(c) Both AC with DC welding (d) Specially designed wave forms

(iv) Which of the following is the type of nontraditional machining?

(a) turning (b) drilling

(c) milling (d) none of the mentioned

(v) Machine tools must be tough enough to withstand _____.

(a) shock (b) vibration

(c) both shock and vibration (d) none of the mentioned

(vi) The forces required for metal cutting operation

(a) increase with increase in the feed of the tool and decreases with increase in the depth of cut

(b) decrease with increase in the feed of the tool and increases with increase in the depth of cut

(c) increase with increase in both the feed of the tool and the depth of cut

(d) decrease with increase in both the feed of the tool and the depth of cut

(vii) The point at which the cutting tool reaches, beyond which it will not function satisfactorily until it is reground, is called as

(a) tool wear (b) tool failure

(c) too diffusion (d) none of the above

(viii) In plate jig, the number of surfaces can be drilled

(a) Only one surface (b) Two surface

(c) Three surface (d) Four surface

(ix) The role of cam rod in box jig is

(a) To clamp the workpiece (b) To guide the drill tool

(c) Both option (a) and (b) (d) None

(x) A buid up edge is formed while machining

(a) Ductile at high speed (b) Ductile at low speed

(c) Brittle at high speed (d) Brittle at low speed

2. (a) Why arc welding of aluminum, magnesium or other nonferrous material is difficult? Explain the correct ways to weld those materials. (5)

(b) Explain the working principle of Gas Metal Arc Welding Process with suitable diagram. Also, write the advantage, disadvantage and applications. (10)

3. (a) Prove the Merchant's formula given as: $\phi = \frac{\pi}{4} - \frac{\beta}{2} + \frac{\alpha}{2}$ where ϕ, β and α are shear plane angle, friction angle and rake angle respectively. (5)

(b) In an orthogonal cutting operation, the following data have been observed:

Uncut chip thickness = 0.127mm

Width of cut = 6.35mm

Cutting speed = 2 m/s

Rake angle = 10°

Cutting force = 567 N

Thrust force = 227 N

Chip thickness = 0.228

Determine the Shear angle, the friction angle, shear stress along the shear plane, and power for the cutting operation. Also find the chip velocity, shear strain in chip, and the strain rate. (10)

4. (a) For tool A:

Taylors tool life exponent is 0.45 and constant is 90

For tool B:

Taylors tool life exponent is 0.3 and constant is 60

Find out the cutting speed in m/min above which tool A will have a higher tool life than tool B. (5)

(b) Explain different type of tool wears in detail with proper diagram. Also explain, how flank wear changes with time? (10)

5. (a) What are the elements of a Jig? Also, write the design considerations of Jig. (5)

(b) Explain box and leaf jig in detail with neat sketch. (5+5)

6. (a) What do you understand by additive manufacturing? Write advantage, disadvantage and applications of additive manufacturing. (5)

(b) Write the working principle, advantage, disadvantage and applications with the neat sketch of following additive manufacturing process. (10)

(i) Stereo lithography Apparatus (SLA) Process

(ii) Fused Deposition Modeling (FDM)

7. (a) Write the working principle, and application of Abrasive jet machining. (5)

(b) Electrochemical machining operations are performed with tungsten as the tool, and copper and aluminum as two different workpiece materials. Properties of copper and aluminum are given in the table below. (10)

Material	At. mass	Valency	Density (g/cm^3)
Copper	63	2	9
Aluminum	27	3	2.7

Ignore over potentials, and assume that current efficiency is 100% for both the workpiece materials. Under identical conditions, if the material removal rate (MRR) of copper is 100 mg/s, then find out the MRP aluminum is mg/s.
