UNIVERSITY COLLEGE TATI (UC TATI)

FINAL EXAMINATION QUESTION BOOKLET	
COURSE CODE	: DTD 3042
COURSE	: NON-TRADITIONAL MACHINING PROCESSES
SEMESTER/SESSION	: 1- 2024/2025
DURATION	: 3 HOURS

Instructions:

1. This booklet contains **4** questions. Answer ALL.
2. All answers should be written in answer booklet.
3. Write legibly and draw sketches wherever required.
4. If in doubt, raise up your hands and ask the invigilator.

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

THIS BOOKLET CONTAINS 4 PRINTED PAGES INCLUDING COVER PAGE

QUESTION 1

a) **Classify** the material commonly used for producing LASER beam.

(3 marks)

b) **Explain** the function of the following components in LBM.

i. Flash lamp

ii. Partial mirror

iii. Lens (6 marks)

c) **Sketch** the photon emission model of LASER. (4 marks)

d) **Describe** the *spontaneous emission* model and LASER *material removal process*. (8 marks)

e) **Distinguish** the CO^2 laser advantages/disadvantages over the solid Ruby laser.

(4 marks)

QUESTION 2

a) In your own words, **describe** the ultrasonic machining (USM).

(3 marks)

b) **Suggest** four (4) abrasive grain materials suitably used for USM.

(4 marks)

c) **Describe** briefly how material removal takes place in USM.

(6 marks)

d) **Explain** the function of *transducer* in USM

(2 marks)

e) **Compare** the production of oscillation motion to the tool by *magnetostrictive* and *piezo-electric* principles for USM machining.

(10 marks)

QUESTION 3

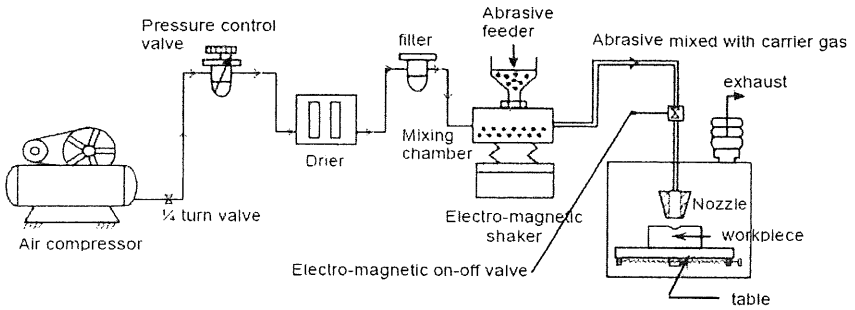

Figure 2: Schematic illustration of AJM.

a) Abrasive jet machining is an alternative machining process for metal and non-metal materials. Based on Figure 2, **describe** how the material removal process takes place.

(10 marks)

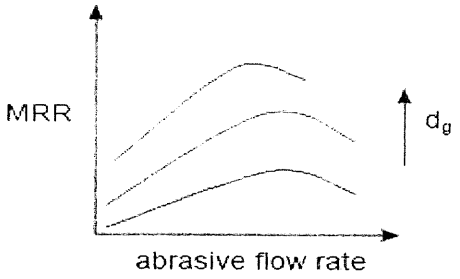

Figure 3: MRR of abrasive jet machining.

b) The graph in Figure 3 shows the phenomenon occurs in abrasive jet machining. **Interpret** the relationship between material removal rate and abrasive flow rate as shown in the figure. (5 marks)

c) **Sketch** the impingement model of how material removal process occurs for abrasive jet machining. (4 marks)

d) **State** three (3) advantages and three (3) drawbacks resulting from the abrasive jet machining process.

(6 marks)

QUESTION 4

a) **Provide** four (4) main components required in an Electric Discharge Machine.

(4 marks)

b) **Explain** the properties of the material that are suitable for EDM machining.

(3 marks)

c) Among the main elements in the EDM process is dielectric fluid. **Explain** the functions of the dielectric.

(6 marks)

d) Material removal process occurs when spark discharge is produced between the electrode and the workpiece. **Describe** how this sparking process is produced in EDM. You may include sketches when necessary.

(6 marks)

e) **Differentiate** the effect of *high peak current* consumption compared to *lower peak current* on MRR, tool wear and the surface quality.

(6 marks)

----------End of question----------

Criteria	Marks
All question answered will be marked according to the answer scheme	/100