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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (S,FE) (FT/WP/PT) Examination December 2025 (2019 Scheme)

Course Code: MET306

Course Name: ADVANCED MANUFACTURING ENGINEERING

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1 What all changes happen when a loose metal powder sample is subjected to compacting pressure? (3)

2 What are the force components considered in Merchant's analysis? Brief the assumptions made in the analysis. (3)

3 What is a programmable logic controller? What are the components of PLC? (3)

4 Differentiate between straight cut and contouring positioning in CNC system. (3)

5 Explain the preferred properties of dielectric fluid in electric discharge machining process. (3)

6 What is nozzle tip distance in abrasive jet machining? How does it impact the machining process? (3)

7 List any six characteristic features of high velocity forming process as compared to the conventional forming. (3)

8 Write a note on the types of elastic body waves. (3)

9 Explain the material removal mechanism of an abrasive flow machining process. (3)

10 What are the characteristic features of an additive manufacturing process? (3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11 a) Explain the mechanism of sintering process and the various stages involved in it. (8)

b) How are particle size, shape and flow characteristics of a metal powder sample quantified? (6)

OR

12 a) Determine the shear plane angle, cutting force component and resultant force when a material of shear yield stress 250 N/mm^2 is subjected to orthogonal (10)

cutting operation. The machining parameters are: tool rake angle 15°, uncut thickness 0.25mm, width of cut 2mm, chip thickness ratio 0.46, angle of friction 40°.

b) In a machining operation, doubling the cutting speed reduces tool life to $1/8^{th}$ of the original value. What is the value of the exponent in Taylor's tool life equation? (4)

Module II

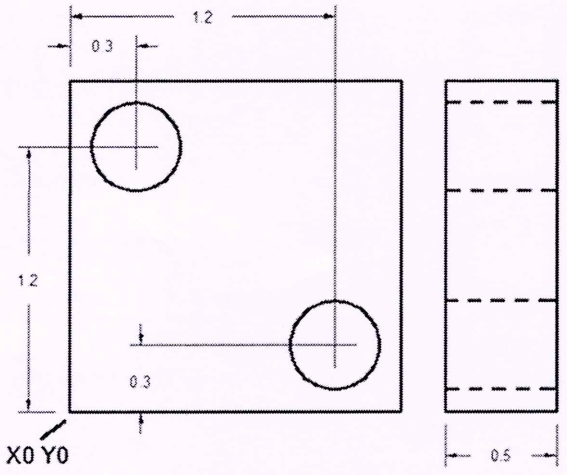
13 a) Explain the four basic types of statements used in APT language with suitable examples. (8)

b) Explain the use of ladder diagram in PLC programming? Name the basic parts of a ladder diagram with neat sketch. (6)

OR

14 a) Differentiate between G codes and M codes used in CNC programming. Give examples for any three G codes and any three M codes and give the interpretation. (8)

b) Write a simple part program for the drilling cycle shown in the figure. Provide the description of each block. The machining parameters may be suitably assumed. (6)



Module III

15 a) Differentiate between a conventional machining process and non-conventional machining process. Comment on application of each type. (6)

b) With the help of neat sketch, explain the set up used in an ultrasonic machining process. Explain the parameters impacting the material removal rate. (8)

OR

16 a) Classify non-traditional machining methods based on energy sources. Discuss any 4 types. (7)

b) Explain the principle and components used in an abrasive water jet machining process with neat diagram. (7)

Module IV

17 a) How does strain rate influence a metal forming process? (6)

b) Explain the principle and components in a standoff explosive forming process. (8)

OR

18 With the help of neat sketches, explain the working principles of electro hydraulic forming and electromagnetic forming and hence compare them. (14)

Module V

19 a) Why is a magnetorheological fluid regarded to be a smart fluid? How is it made use of in a magnetorheological finishing process? (14)

OR

20 a) What is the composition of a liquid photopolymer? Explain an additive manufacturing process that makes use of a liquid photopolymer. (14)

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