Department of Mechanical Engineering
Indian Institute of Technology Kanpur
TA – 202: Manufacturing Processes
Mid. Sem. Exam.
VKJ/2014/SI; Time: 120 min; Max. Marks: 120

NOTES:
(I) Answer all questions in the space provided in the question paper itself.
(II) Answers should be brief, to-the-point and be supplemented with neat sketches, if necessary.
(III) Figures on the right-hand side within parentheses indicate full marks.
(IV) No clarification is encouraged.
(V) Your signature on the pledge is mandatory.

NAME …………………………….................. ROLL NO. ………………………………

CLASS ……………………………………… SECTION ………………………………

PROJECT GROUP NO. ……………………….. SUBJECT ……………………….

DATE ……………………………..

FOR EXAMINERS ONLY

QUESTION NO.	MARKS
Q-1	
Q-2	
Q-3	
Q-4	
Q-5	
Total	

I PLEDGE MY HONOR AS A GENTLEMAN/LADY THAT DURING THE EXAMINATION I HAVE NEITHER GIVEN ASSISTANCE NOR RECEIVED ASSISTANCE.

……………………………

Signature

Q. 2: (A) Fill in blanks. [1 x 3]

(i). Manufacturing is a Latin word made of ……………………… which means 'made by hands'.

(ii). Clay costs Rs. 15/kg and a dinner plate made of the same clay costs Rs. 200/kg. We can say it as: Clay has undergone ………………………………

(iii). Economic health of a country largely depends on ………………………………………………… of that country.

(B). (i). A workpiece is shown in Fig. 4. What cutting conditions will you recommend to reduce its height to 19 mm using milling operation? [3]

(a). ………………………………………………………………………………

(b). ………………………………………………………………………………

(c). ………………………………………………………………………………

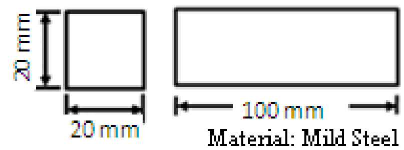
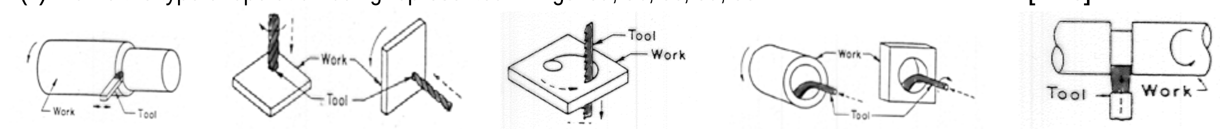


Fig. 4

(ii). Name the type of operation being represented in Figs. 5a, 5b, 5c, 5d, 5e. [1 x 5]

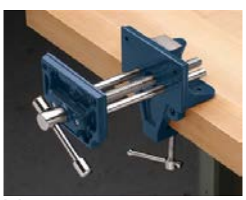


(a) (b) (c) (d) (e)

(1) ………………… (2) ……………………. (3) ………………… (4) …………………….. (5) ……………………..

Fig. 5

(C). Write the names of tools/ devices shown in Fig. 6. [1x 4]



(a). …………………..

(b). ……………………..

(c). …………………………

(d). …………………………

(e). …………………………

(f). ……………………………

Fig.6

(D). (i). Write the names (no description) of two traditional material removal processes for making following types of workpieces.

(a). Circular shape: …………………………, (b). Prismatic shape: ……………………………….. [2 + 1]

(ii). Hardness of the BUE as compared to the chip is: (a). Lower, (b) higher, (c) same.

(E). (i). Sketch three orthographic views of a single point turning tool and indicate its different angles and nose radius. [6]

Q. 1: (A). Fill in the blanks. [1 x 3]

(i). Production system should be ………………… to meet varying demands (quantity, delivery date etc.).

(ii). What 4M stands for in a Manufacturing Organization?: …………………, ………………, ……………………, ……………………

(iii). You cannot make a part or a feature if you cannot ……………………… it.

(B). (i). What are the approximate cutting conditions you will use to reduce length of the workpiece (Fig. 1) by 5 mm using lathe m/c. Write the name of operation also. Reasonably good surface finish is needed. HSS tool nose radius is 1 mm. [4]

(a). ……………………………………………………………………………

(b). ……………………………………………………………………………

(c). ……………………………………………………………………………

(d). Name of operation: ……………………………………….

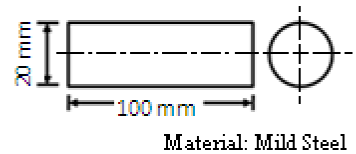


Fig.1

(ii). Write the names of different parts of an NC machine (Fig. 2). [10 x ½ = 5]

(1). …………………, (2). …………………, (3). …………………

(4). ……………………, (5). …………………………….

(6). …………………………

(7). …………………………

(8). …………………………

(9). …………………………

(10). ………………………

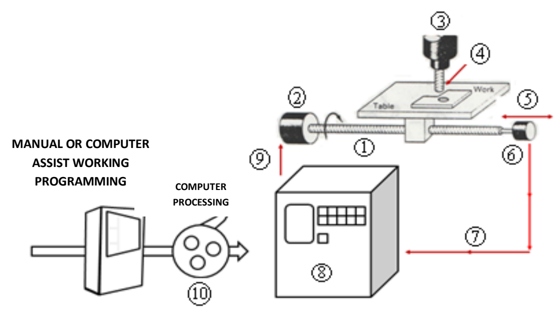
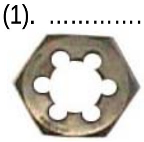


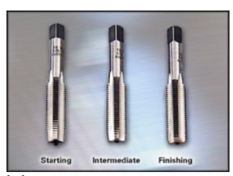
Fig. 2

(C). Write the names of tools/ devices shown in Fig. 3. [6 x ½ = 3]

(1). ………………



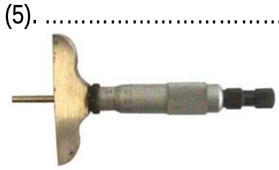
(2). ………………



(3). …………………

(4). …………………

(5). ……………………………



(6). …………………………

Fig. 3

(D). (i). Write the **names (no description)** of finishing operations for each case: (a) Bonded abrasives, (b). Loose abrasives.

(a). ……………………….., (b). …………………………… [1 x 2 = 2]

(ii). Encircle which type of chip will be produced with aluminum as workpiece, having cutting conditions with high friction between tool and chip: (a). continuous chip, (b). discontinuous chip, (c). segmented chip, (d). continuous chip with BUE. [1]

(E). (i). Sketch an orthogonal cutting process showing all the forces along with the resultant force. Label each force type and other components of the process. Write full form of abbreviations used. [3 + 3]

(1). ……………………………………

(2). ……………………………………

(3). ……………………………………

(4). ……………………………………

(5). ……………………………………

(6). ……………………………………

(7). ……………………………………

P.T.O

Q. 3: (A). Fill in the blanks. [1+2+1]

(i). You can not design a part if you can not ……………………… it.

(ii). Suppose you are making 1 million paper clips per day. Name *four* important issues that you will like to consider (No discussion): …………………………… , ………………………… , ………………………… , ……………………………

(iii). Total Quality Control (TQC) means the quality must be built into a product starting from the design stage through all subsequent stages of ……………………… and …………………………

(B). (i). Write various types of basic / primary manufacturing processes (No sub-classification is required). [3 + 2 + 1]
…………………………, ……………………, ………………………, ……………………, ……………………, ………………………

(ii). A shaft is to be made on a lathe m/c with the following dimensions. Diam. = $10^{+0.02}_{-0.03}$ mm and length =$50^{+0.05}_{-0.01}$ mm. Answer the following:

(a). The machined shaft has diameter as 9.97 mm and length equal to 50.05 mm. This shaft will be accepted or rejected? ……………………

(b). Does it have unilateral tolerance or bilateral tolerance or both? ………………………

(iii). A part has been milled and the surface roughness value required is 1.0 to 1.2 μm or better. After measuring the milled surface, surface roughness is reported as follows, Ra = 0.95 μm. Will you reject or accept the part? ………………………

(C). Write the names of the following: [5 x ½ = 2.5]

(1). ……………….. (2). ……………… (3). ……………… (4). ………………… (5). …………………

Fig. 7

(D). Write the names of different parts of the machine shown in Fig. 8. [8 x ½ = 4]

(1). ……………………………
(2). ……………………………
(3). ……………………………
(4). ……………………………
(5). ……………………………
(6). ……………………………
(7). ……………………………
(8). Name of Machine: …………………………

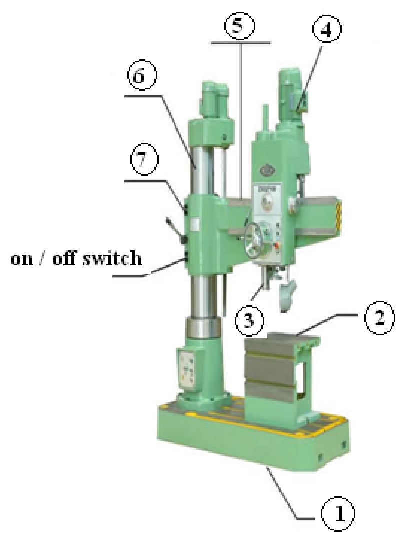


Fig. 8

(E). During face turning operation of mild steel rod of 100 mm length, the feed rate used was 6 mm/min, RPM = 100, depth of cut = 0.5 mm and diam. of the rod was 50 mm. Due to wear of tool, its nose radius changes from 2 mm to 3 mm. [1 + 1.5 + 1 + 1 + 1.5 + 1.5]

Find out: (i). Surface roughness obtained with a new tool, (Ra) = ……………………………

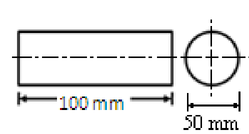
(ii).Surface roughness obtained with worn out tool, R_{max} = ………………………………

(iii). Change in diameter = ………………………………

(iv). Change in length = ……………………………………

(v). Volume of material removed in one pass = …………………………………………

(vi). Total time required to complete one pass = …………………………………………



Q. 5: (A). Fill in the blanks. [1 + 2 + 2]

(i). To capture the market in today's competitive world, the customer should not be only satisfied, but s/he should be …………………

(ii). The advantages of automation are …………………………, …………………………, ………………………….., ……………….. ……………………….

(iii). Advantages of CNC are: ………………., ……………………, ……………………., …………………………..

(B). (i). What do you mean by a hybrid process? [2]

(C). Write the names of different parts of the machine shown in Fig. 11. [10 x ½ = 5]

(1). ………………………..

(2). …………………………

(3). …………………………

(4). …………………………

(5). …………………………

(6). …………………………

(7). …………………………

(8). …………………………..

(9). …………………………

(10). …………………………

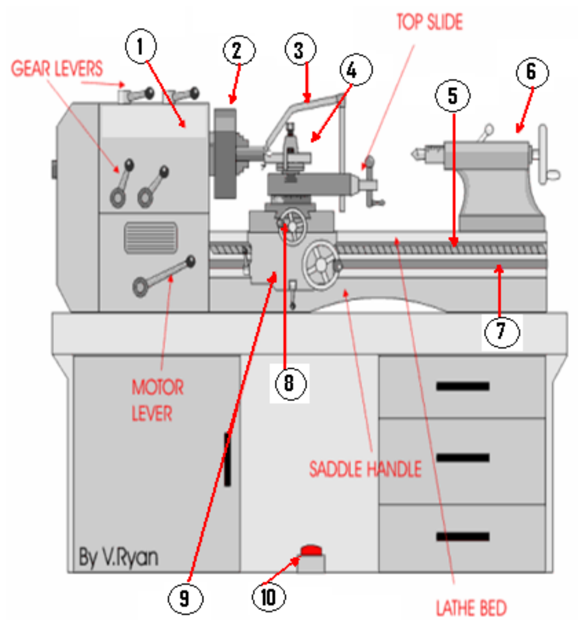


Fig. 11

(D). (i). Write three conditions for a cutting process to be 'orthogonal cutting'. [3]

(1). ………………………………………………………………………………………

(2). ………………………………………………………………………………………

(3). ………………………………………………………………………………………

(E). A workpiece shown in Fig. 12 is turned. Due to wrong selection of the tool material, in one pass of turning the tool flank face length (normal to AB) reduces by 1 mm at constant wear rate. The designed depth of cut was 2 mm. Calculate:

(a). Error in terms of taper produced on the workpiece (Calculate taper angle). [2]

(b). Calculate the radius of the machined part at the middle of AB. [2]

(c). Calculate the total material removal in one pass (Accounting for tool wear). [3]

(d). Give the approximate tool specifications to be used in this case (only number). [2]

<u>Solution:</u>

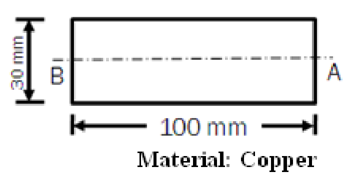


Fig. 12

<u>Good Luck</u>

Q. 4: (A). Fill in the blanks. [1 + 2.5]

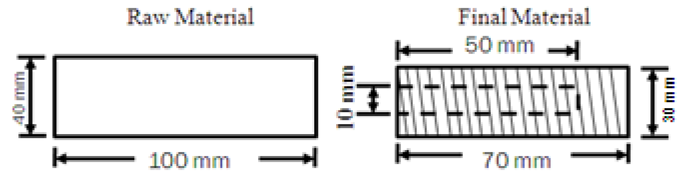
(i). DNC is a type of numerical control m/c (write True or false). ……………………….

(ii). Write full form of following abbreviations.

(a). AGV ………………………………………, (b). CNC ………………………………………, (c) CAPP …………………………………………......, (d). MCU …………………………………….…, (e). BUE ………………………….

(B). (i). Looking at the figure, write the names (Fig. 9) of the operations you will perform in TA-202 Lab. in *proper sequence* to convert raw material (Fig. 9a) into a final product (Fig. 9b). Assume only one type of machine is to be used. [4]

(1) ……………………………..
(2)……………………………..
(3)……………………………..
(4)……………………………..



(a) (b)

Fig. 9

(C). Write the names of different parts the machine shown in Fig. 10. [7 x ½ = 3.5]

(1)………………………………….
(2)………………………………….
(3)………………………………….
(4)…………………………………
(5)…………………………………
(6)………………………………….
(7). Type of Machine: ……………………………..

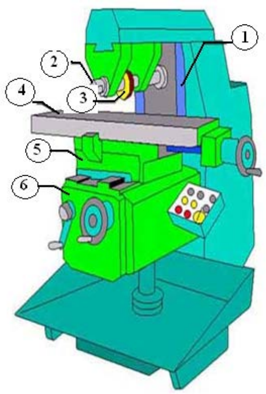


Fig. 10

(D). (i). Sketch a cutting process showing three sources of heat generation. Also write the reasons for the heat generation in each case (not more than five words for each reason). [3 + 3]

(1)…………………………………………………………………………

(2) ……………………………………………………………………………….

(3)…………………………………………………………………………

(E). (i). One million parts per day are produced. Their hole diameter is most critical and it decides whether to accept or reject the part. Name the instrument you will use to check its acceptance / rejection. ……………………………….. [1 + 2]

(ii). Hole diameter = $20^{+0.2}_{-0.0}$ mm

Shaft diameter = $20^{+0.0}_{-0.2}\ mm,$ Which fit has the highest probability to occur? ……………………………………..

(F). Draw a three stage flank wear curve for a single point cutting tool. State in which range you will like to stop its use and go for grinding / sharpening of the tool. [3 + 1]

P.T.O