BITS, PILANI DUBAI CAMPUS

WORKSHOP PRACTICE (TA UC112)

I SEMESTER 2005-2006 COMPREHENSIVE EXAMINATION (Regular)

Max. Marks 75 **Duration : 180 Min.**

Closed book **Date: 27/12/05**

- **Answer *all sub questions of a particular question sequentially*.**
- **Assume any missing data suitably.**
- **Give proper justifications wherever required and underline the keywords.**

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1. **(a)** Finishing operations ensure good dimensional accuracy and surface finish. Why all the products produced are not subjected to finishing operations? **2M**

(b) Determine the *type of fit* that can be obtained if the limits on the hole and shaft are:

Hole: $50.00^{-0.026}_{-0.065}$ mm Shaft: $50.00^{-0}_{-0.011}$ mm **3M**

2. **(a)** Component shown in figure 1 is to be manufactured from casting process.

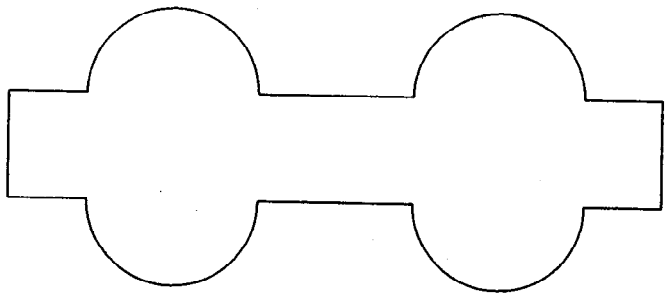


Figure 1 Figure for question 2(a)

(i) Which *type of pattern* should be used for manufacturing the component?
(ii) In which *position* (vertical or horizontal) you are going to cast the part?
(iii) Which *pattern material* you are going to suggest if it is (a) Mass production (b) Job production? Justify your answers. **6M**

(b) Are punch and die are one and the same? Justify your answer. **2M**

(c) State the *material properties* that are important for manufacturing

(i) Shaving blades, (iv) Utensils
(ii) Body of automobiles. (v) Shock absorbers
(iii) Medals & coins (vi) Springs **3M**

(d) Component shown in figure 2 was manufactured by NASA for one of its projects. Diameter of the component is 10 ft. Which *method of manufacturing* NASA might have used? Justify your answer. **4M**

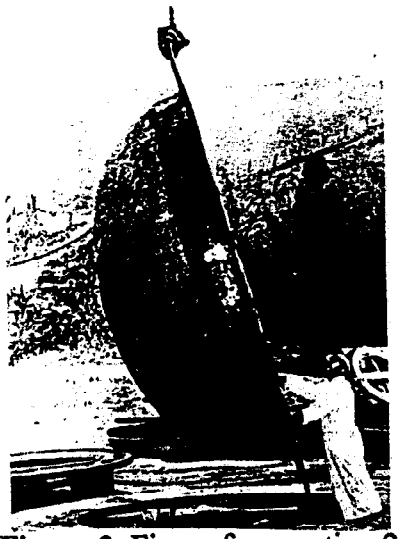


Figure 2 Figure for question 2(d)

3. **(a)** For *TECHNOFEST* function of BPDC; it is required to distribute medals for prize winners. The medal should have emblem of BITS, Pilani (with 1 mm projection at one end and depression at other end). The medal should also include name of the event, position won, name and ID number of student. If you are assigned the job of producing medals,

(i) Which *method of manufacturing* you are going to use for manufacturing medal?

(ii) Can it be done at BPDC workshop?

(iii) Is it a job production/batch production or mass production?

Justify your answers. **3M**

(b) Is battery operated wall clock an example of *mechanization* or *automation*? Justify your answer. **2M**

4. **(a)** Stress strain curve of certain material is shown in figure 3.

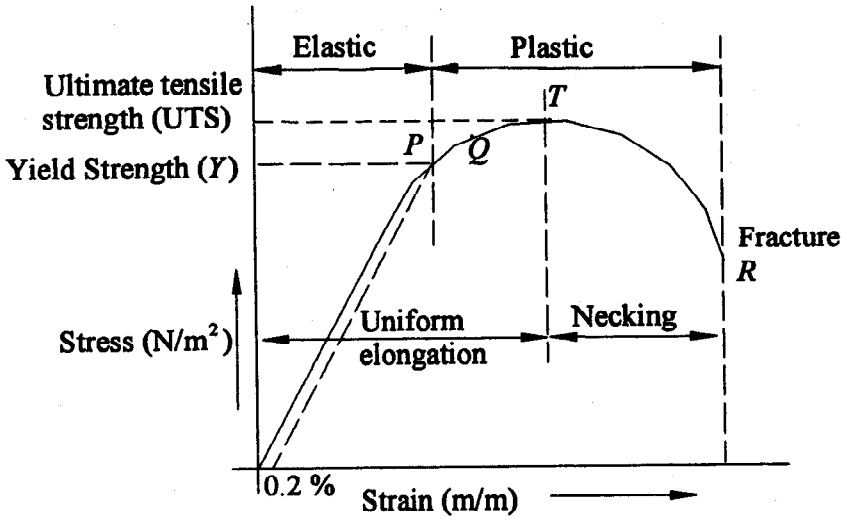


Figure 3 figure for question 4(a)

(i) Identify the *type* of material.

(ii) What is the purpose of drawing dotted line at 0.2% strain?

(iii) Is it possible to find toughness and resilience from the figure? If yes, how it can be found?

(iv) After point 'T' why curve bends downwards despite increasing the load till the fracture point? **5M**

(b) In a typical metal cutting operation, when v = 50 m/min, T= 50 min. When tool life was increased to 70 m/min tool life reduced to 10 min.

(i) In which case more material is removed and why?

(ii) What inference you can draw from the result? **5M**

[Hint: Volume of material removed ∝ length of tool travel]

(c) Refer figure 4. Find (i) Taylor's tool life equation (ii) Find the cutting speed to obtain a tool life of 50 min. **5M**

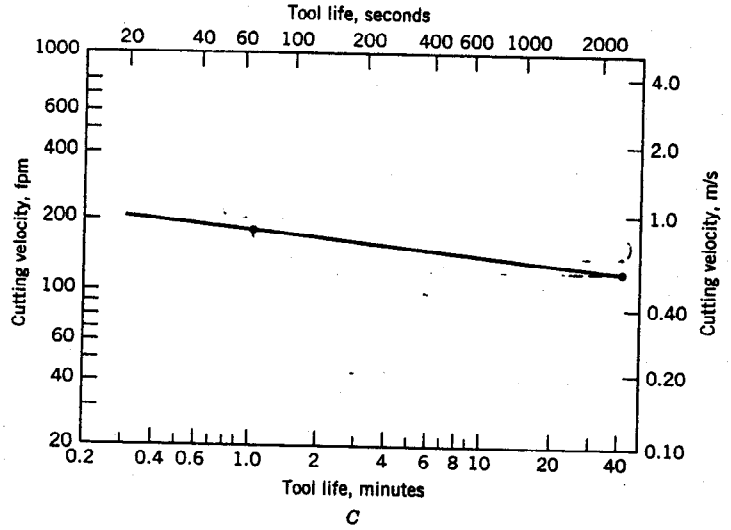


Figure 4 Figure for question 4©

5. **(a)** Write a graph of cost vs inventory level. Indicate *EOQ* on the graph. **2M**

(b) Company has an order for manufacturing 1, 00,000 components per month shown in figure 5 (all dimensions in mm).

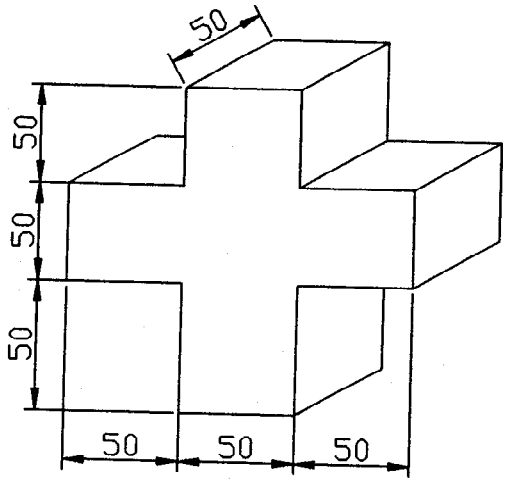


Figure 5 Figure for question 5(b)

Owing to technical considerations company has ruled out the possibility of manufacturing the component by casting process. Which *method of manufacturing* is more appropriate? Justify your answer. **4M**

(c) It is required to manufacture three jobs. Their processing times and due dates are as follows:

Job	Processing time (min.)	Due date
1	20	1st June 2005
2	40	5th July 2005
3	30	30th May 2005

Schedule of jobs according to SPT, LPT and EDD rules are given below.

SPT rule: Jobs 1 → 3 → 2
LPT rule: Jobs 2 → 3 → 1
EDD rule: Jobs 3 → 1 → 2

Production Manager is in the process of finalizing the schedule. Foreman of the workshop after looking at the schedule pointed out that *irrespective of type of schedule, total processing time will be 90 minutes* and expressed his opinion that "*since total processing time remain same, we can chose any scheduling rule and selection of scheduling rule will not make any difference*".

(i) Is foreman right?

(ii) If foreman is wrong, than what would be your answer? **5M**

6. (a) Derive an expression for BEP of a single product. Indicate the same on diagram. **3M**

(b) Why manufacturers of electric bulbs do not produce bulbs having 35W, 55W..., machine tool manufacturers manufacture machine spindle rpm's 168, 277....? **3M**

(c) A final product has to be made by assembling part A1 into the threaded hole of part B1 (refer Figure 6). The dimensions of raw materials for part A1 and part B1 are shown in Figure A and B, respectively. Part A1 is to be manufactured by lathe operations and B1 by milling, drilling and tapping operations. Machining details for both the parts are shown in the table 1. Considering that the material needs to be removed in a single pass for each operation, calculate the *total time* to manufacture the final product. Time for assembly is 0.5 minute. Neglect setup and idle time. **14M**

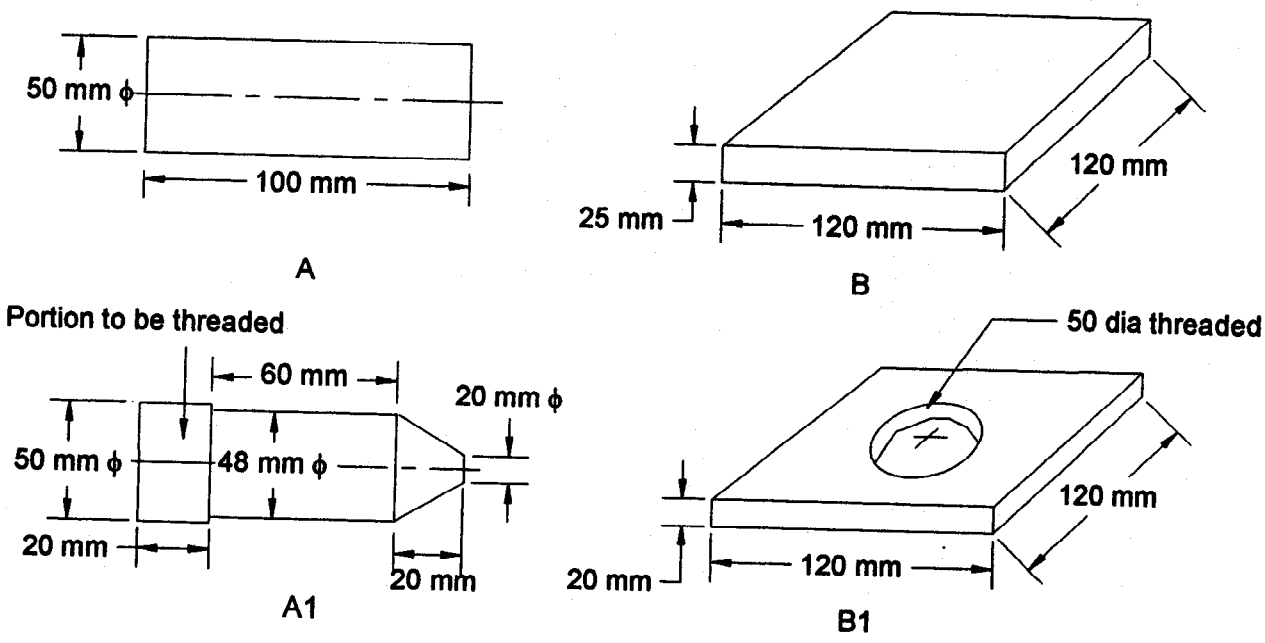
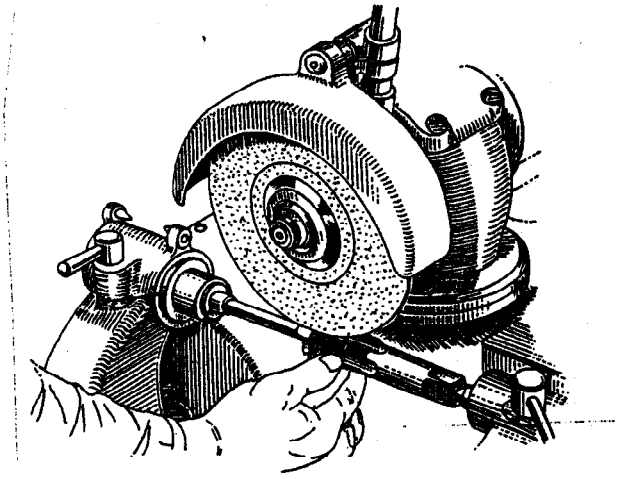


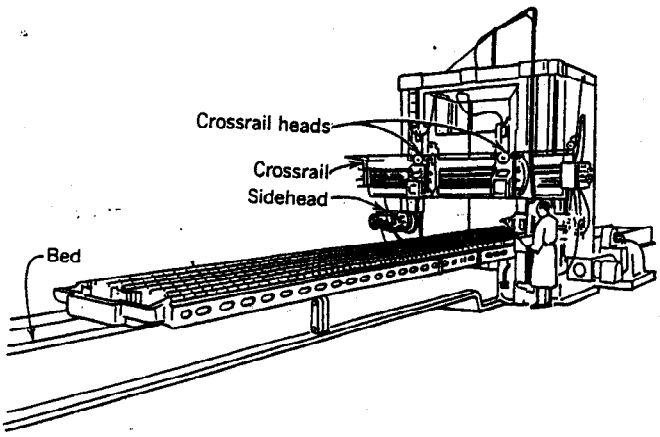
Figure 6 Figure for question 6©

	Lathe operations	**Milling operations**	**Drilling & tapping operations**
Tool	HSS turning tool	HSS face milling cutter	HSS twist drill/tap
Feed	0.5 mm/rev. for straight turning 0.25 mm/rev. for taper turning 0.2 mm/rev for thread cutting	0.2 mm/ tooth	0.1 mm/rev. for drilling, 0.09 mm/rev for tapping
Cutting speed	80 m/min for straight turning 50 m/min for taper turning 30 m/min for thread cutting	45 m/min	60 m/min(drilling) 30 m/min(tapping)
Cutter diameter	Not applicable	110 mm	Not applicable
No. of teeth	Not applicable	24	Not applicable
Clearance	Not applicable	30 mm	15 mm

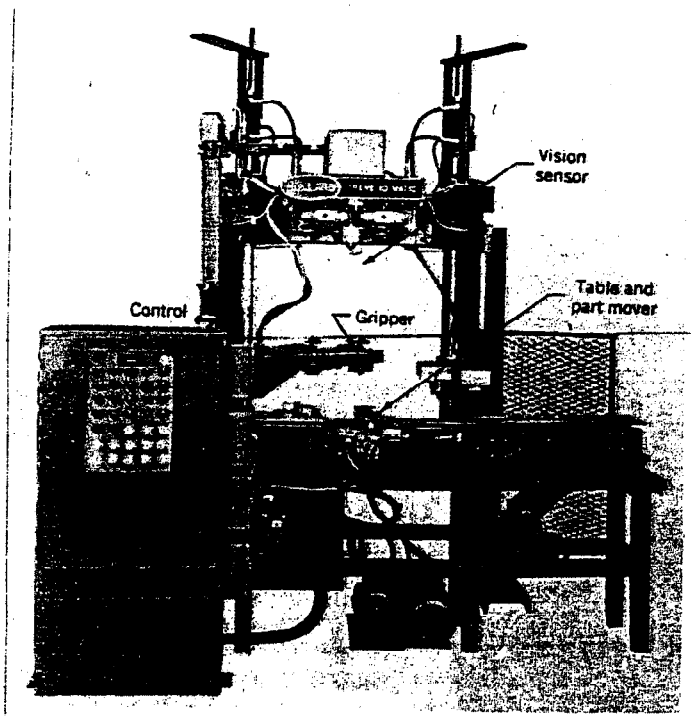
7. *Identify* the type of machine tools, cutters and workholding/tool holding devices shown in figure 7. **4M**



(a)

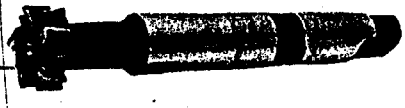


(b)

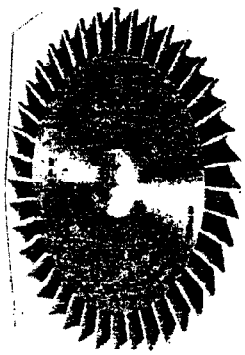


(c)

(d)



(e)



(f)

(g)

(h)

Figure 7 Figure for question 7

BITS, PILANI DUBAI CAMPUS
I Year - First Semester 2005-2006
Workshop Practice TA UC112

Course No. : TA UC112
Duration: 30 Min.
Note:

Date : 9/11/05
Marks: 20 M

1. **Answer only in the sheet provided.**
2. ***Wrong answer carries –0.25 marks.***
3. **Put ✓ for the correct answer. Do not overwrite or scribble.**
4. ***Write Version of your question paper, Name, ID No., on the answer sheet.***
5. ***Return the answer sheet.***

VERSION A

1. What is the factor of safety of a glass material if its yield strength is 60 Mpa, ultimate stress is 80 Mpa and the design stress is 10 Mpa?
   (a) 2 (b) 4
   (c) 6 (d) 8

2. Which statement is true for ceramics?
   (a) Ceramics are commonly oxides, nitrides and carbides.
   (b) Insulators of heat and electricity.
   (c) Hard and brittle.
   (d) All of the above.

3. Difference between hole size and shaft size is called
   (a) Tolerance (b) Fit
   © Allowance (d) None of the above

4. In Taylor's tool life equation $vT^n = C$ (with usual notations)
   (a) n>C (b) C>n
   © n = C (d) We cannot say

5. _____ is used between the two halves of the mould.
   (a) Moulding sand (b) Green sand
   © Parting sand (d) Clay

6. For a job having diameter of 40 mm and length 100 mm, while doing facing operation length of tool travel will be
   (a) 20 mm (b) 40 mm
   © 100 mm (d) 50 mm

7. In 8-4-1 HSS tool steel digit '1' indicates
   (a) Molybdenum (b) Tungsten
   © Chromium (d) Vanadium

8. A watch that is working but never shows the correct time is lacking
   (a) Quality
   (b) Reliability
   © Accuracy
   (d) Precision

9. In a facing operation if depth of cut is 2 mm, length of the job is reduced by
   (a) 4 mm
   (b) 2 mm
   © 1 mm
   (d) None of the above

10. Which statement is true for lip angle (BRA = Back rake angle, CA = Clearance angle)
   (a) 90^0 – BRA – CA
   (c) 90^0 – BRA + CA
   (b) 90^0+ BRA – CA
   (d) None of the above

11. MRR (mm^3 /min) in a shaping machine is given by (If d is the depth of cut, L is the length of stroke, m return stroke time to cutting stroke time, f is the feed in mm/stroke)
   (a) $MRR = f \times N \times L(1+\text{m})$
   (b) $f \times d \times L(1+\text{m})$
   © $f \times d \times N \times L(1+\text{m})$
   (d) None of the above

12. For smoothening the surfaces of the mould---------is used.
   (a) Draw spike
   (b) Riddle
   © Shovel
   (d) None of the above

13. For manufacturing components which are having projections, undercuts, best suited pattern is
   (a) Loose piece pattern
   (c) Split pattern
   (b) Solid pattern
   (d) Gated pattern

14. Plain milling is also known as
   (a) Up milling
   (b) Down milling
   © Slab milling
   (d) End milling

15. In tool signature last position indicates
   (a) Nose radius
   (b) Back rake angle
   (b) Side rake angle
   (d) None of the above

Answer true or false.

1. A split nut in the apron is used to engage the lead screw with the carriage for automatic feed.
2. Jigs & fixtures, accessories & attachments are one and the same.
3. If the hole is made for the part of length of workpiece, then it is called blind hole.
4. Tolerance is the difference between limits of size.
5. Up milling is also known as conventional milling.

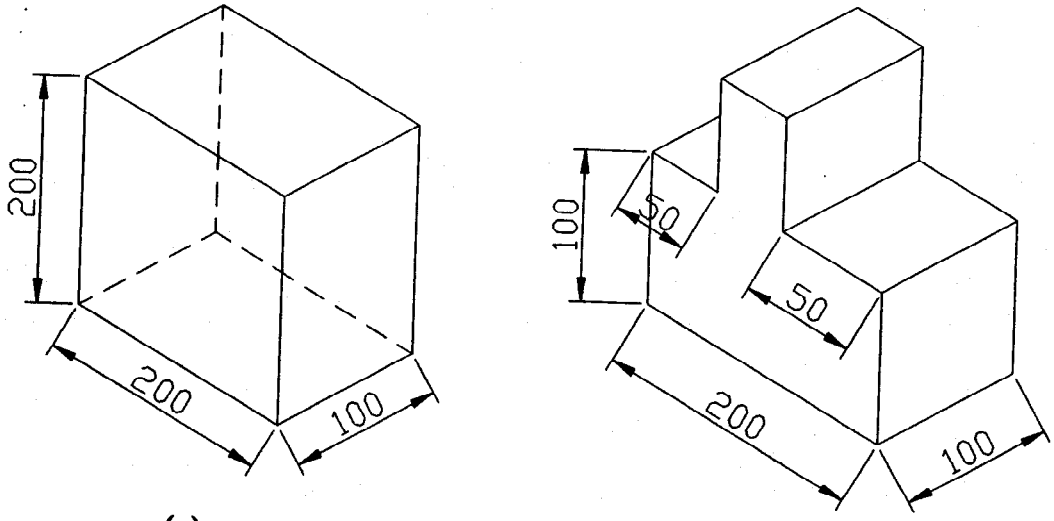
BITS, PILANI DUBAI CAMPUS
WORKSHOP PRACTICE (TA UC112)
I SEMESTER 2005-2006 Second test (Regular)

Max. Marks: 30 **Duration: 50 Min.**

Open book **Date: 27/11/05**

- **Answer all the questions**
- **Assume any missing data**
- **Answer all the questions sequentially. Avoid elaborate answers**

1. **(a)** Refer to figure 8.7,8.8 and 8.9 (page 154,155). In which case you make use of equation 8.12 for calculating length of tool travel? Justify your answer. **2M**
   (b) Component shown in figure 1(a) is to be machined to size as shown in figure 1(b) using milling machine. Calculate the total time for machining. Use the following data: Cutter: Side and face cutter, Diameter of cutter = 25 mm, Maximum depth of cut = 5 mm, feed = 1mm/rev, number of teeth = 20, cutting speed = 50 m/min, width of cutter = 20 mm. Keep a stock of 1 mm for finish cut. Available rpm on machine tool spindle are: 600,650,700 and 750. Assume approach length = 10 mm, overtravel = 5 mm. **8M**



(a) **(b)**

Figure 1 Figure for question 1(b)

2. A circular cylinder of diameter 10 cm and height 20 cm is cast with its circular base parallel to the ground, using a cast iron pattern. Using the following data calculate the pattern dimensions.

Type of Allowance	Amount of allowance
Shrinkage	1/192 cm per cm of radius
	1/96 cm per cm of height
Machining	2.5 cm on diameter
	2.5 cm on height
Taper	3/2°

Write your final answers in tabular form as shown below: **5M**

Allowance	Dimensions after allowance		
	Top Diameter (cm)	Bottom Diameter(cm)	Height(cm)

3. **(a)** During arc welding sometimes electrode sticks to the workpiece material. Why does it happen? What a welder should do to overcome this problem? **2M**
(b) Which material is easy to weld low carbon steel or high carbon steel? How about cast iron? Give proper reasoning for your answer. **5M**

4 **(a)** Refer to figure 12.3 what are the consequences of (i) using unequal diameter rolls (ii)using rolls of different material (iii) rotating the rolls in the same direction (iv)using rolls having very smooth shiny surfaces and rough surfaces. **4M**
(b) It is required to manufacture small and medium size components by forging process. Assuming mass production, which type of forging process you recommend when (i) it is required to obtain bulk deformation (ii) to produce intricate shapes and minor details on the components. Will your selection be same if it is job shop production? **4M**

BITS, PILANI DUBAI CAMPUS
WORKSHOP PRACTICE (TA UC112)
I SEMESTER 2005-2006 FIRST TEST (Regular)

Max. Marks: 25 **Duration: 50 Min.**
Closed book **Date: 16/10/05**

- **Answer all the questions**
- **Assume any missing data**
- **Answer all the questions sequentially. Avoid elaborate answers**

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1. (a) Do you think the presence of phosphorous and sulphur in steel influences its properties? If so how?
   (b) Is it possible to manufacture components which are precise without being accurate? How about components which are accurate without being precise? If yes, give examples of dimensions. If no, give reasons why it cannot be made.
   (c) We use single point cutting tool on lathe and shaping machines. Can we use the *same tool* on both the machines? Why or why not? Justify your answer.
   (d) For manufacturing drill tool, among toughness and hot hardness which property is more important? How about manufacturing of shaping tool? Justify your answer.

   2M×4

2. Two rectangular plates 400×800×30 mm is to be machined to a size of 400×800×20 mm and then assembled using hexagonal headed bolt. It is required to give 5 mm seating for head of bolt. Diameter of the hole to be made on rectangular plates before assembling hexagonal headed bolt is 20 mm. All operations are to be carried out using shaping and drilling machines.

   Use following data (with usual notations given in the book): for shaping machine: f = 2 mm/stroke, v=20 m/min, maximum depth of cut =2 mm, depth of cut for finishing =0.5 mm, Clearance at each end = 75 mm, available ram strokes are: 20, 40, 60 and 80, m =2/3, maximum length of stroke available on machine = 900 mm, maximum width of job that can be accommodated on the machine vice is 1000 mm. Same amount of material is to be removed from all sides. Keep a stock of 1 mm for finishing cut.

   For drilling & allied operations: N = 100 rpm, f = 1 mm/rev, neglect approach and overtravel distances for all drilling and allied operations.

   Assume moving time from one machine to other = 2 min, setup time on each machine = 2 min, time for assembly = 2 min.

   (a) Write a possible sequence for manufacturing the part.
   (b) Calculate manufacturing time.
   (c) Instead of using two machines, is it possible to do all the operations on a single machine tool? If yes, which machine tool can be used? Justify your answer.

   17M