

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: BE  
BRANCH: PRODUCTION**

**SEMESTER :VI  
SESSION : SP/19**

**SUBJECT: PE6001 TOOL DESIGN**

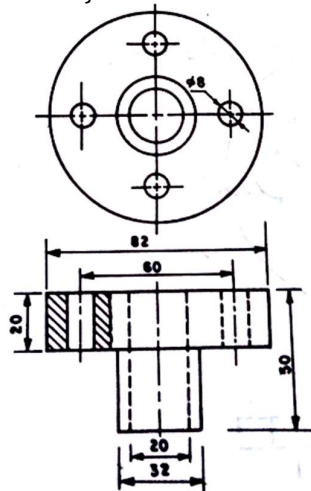
**TIME: 3.00 Hrs.**

**FULL MARKS: 60**

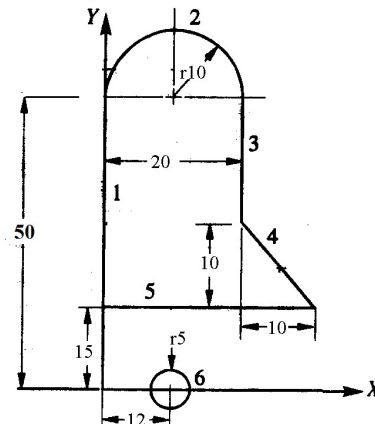
**INSTRUCTIONS:**

1. The question paper contains 7 questions each of 12 marks and total 84 marks.
  2. Candidates may attempt any 5 questions maximum of 60 marks.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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- Q.1(a) What are the advantages of using Jigs and fixtures? [2]  
 Q.1(b) What is quick acting clamping? Explain in brief. [4]  
 Q.1(c) Give detail explanation of how locating is done from plane surface, circular surface and irregular surface? [6]
- Q.2(a) Explain different type of drill bush used in drill jig. [2]  
 Q.2(b) List different types of milling fixture. Explain any two with neat sketch. [3]  
 Q.2(c) Design a suitable drill jig for given figure and also discuss about location, clamping and other provision you made in fixture for enhance productivity. [7]



- Q.3(a) What do you understand by the constructional and technological components of a die set assembly? [2]  
 List various components of die set assembly under these categories.
- Q.3(b) Write short notes on (i) transfer die (ii) progressive die (iii) compound die (iv) inverted die [4]
- Q.3(c) What is centre of pressure? Discuss its utility. Locate the centre of pressure for the component shown in the figure. [6]

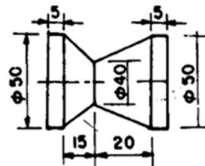


- Q.4(a) What do you mean by the term blanking and piercing? Clearly differentiate between the two. [2]  
 Q.4(b) A pressing of complicated shape weighs 600 gms and is made from 1.50mm thick plate material and whose weight per sq. cm. is 1.2 gms. Find the equivalent blank diameter required. If this blank is used to obtain a cup of height equivalent to diameter then what is the diameter of cup. [4]  
 Q.4(c) A manufacture wants to produce 2000 washer per week from 1.50 mm thick (t) mild steel sheet having width 30 mm. Washer have external diameter 25 mm and internal diameter 12 mm. Calculate dimension of dies and punches. Calculate the press capacity required (i) tools without shear (ii) tools with shear 1.5 t, also find the utilization of metal sheet. Take penetration 75 % of t, press efficiency 70%, Modulus of Elasticity 210 GPA and tensile strength 400MPa, clearance 7% of t, provide the gap t between two blank out part(strip layout). [6]

- Q.5(a) Distinguish between working element and mounting elements of cutting tools. [2]  
 Q.5(b) Make all 3 views of a tool bit and label all the essential parts. Write tool signature and recommend some suitable values of tool angles. [4]  
 Q.5(c) A lathe worker want to machine a structural steel for getting his required product. The diameter of the workpiece is 120 mm. The cutting force component on a tool point, while machining structural steel with a 12° back rake angle, high speed steel tool is given by  $F = 540 \times 10^{10} f^8 d N$ . where F is cutting force, f feed in mm per revolution and d is depth of cut in mm. If feed is 0.06 mm/rev, depth of cut is 1.25 mm, design a suitable circular cross-section of the cutting tool if the maximum permissible deflection of the tool is 0.06 mm. For designing purpose take the shear strength and young's Modulus of the tool material 250N/mm<sup>2</sup> and 200x10<sup>3</sup> N/mm<sup>2</sup> respectively and factor of safety 3. Find the extent by which the tool can be projected out of the tool post for machining purpose. As per Indian standard the recommended value of shank diameter (in mm) are as follows. [6]

Diameter	6	8	10	12	16	20	25	32	40	50	63
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- Q.6(a) What are the main factors to be considered in the design of plain milling cutters? [3]  
 Q.6(b) What is a form tool? How are they classified? Design the form tool for the given work piece and write the procedure. Take back rake angle and clearance angle are 12° and 10° respectively. [9]



- Q.7(a) Discuss the justification of the use of special tooling/ equipment with the help of following data [3]  
 Machining cost using existing equipment : Rs 80.00  
 Machining cost using special equipment : Rs 35.00  
 Cost of special equipment (including installation) : Rs 9000.00  
 Q.7(b) Name and discuss at least five tool materials that are commonly used for single point tools. [4]  
 Q.7(c) The following data refers to four methods of production each involving the purchase of new machine tools and new equipment. [5]

S. No.	Item	Method A	Method B	Method C	Method D
1.	Number of working hours per year	1800	1800	1800	1800
2.	Machining time per component (in minutes)	12	10	7.5	6
3.	Tool life (in years)	2	1.5	1	0.5
4.	Machine rate per hour	Rs 20	Rs.25	Rs.30	Rs.35
5.	Cost of tooling	Rs 500	Rs.750	Rs.1000	Rs.1500

Suggest the most economical method.

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