

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

**CLASS: BTECH.  
BRANCH: PRODUCTION & INDUSTRIAL ENGINEERING**

**SEMESTER : VI  
SESSION : SP/2023**

**SUBJECT: PE313 TOOL DESIGN**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

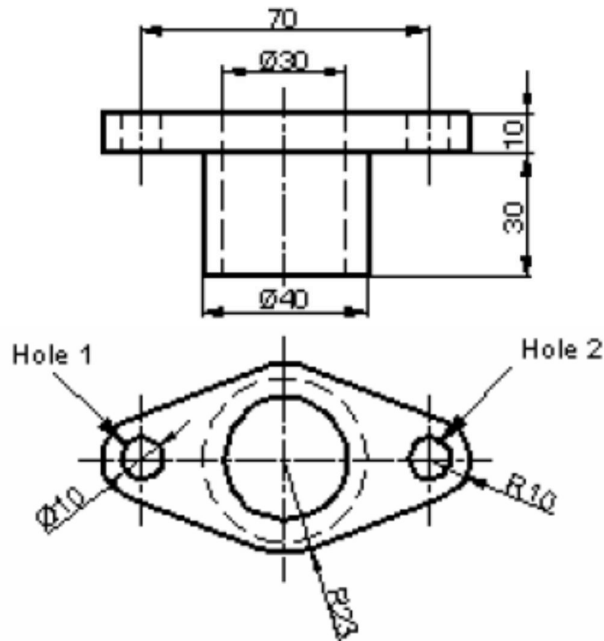
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|  | CO  | BL  |
| Q.1(a) List the cutting tool materials commonly used for high-speed cutting.   | [5] | 1 3 |
| Q.1(b) A lot of 120 pieces have to be machined. The estimated cost components in three different modes are as follows: | [5] | 1 6 |

Mode	Fixed cost (Rs.)	Machining cost / pc (Rs./piece)
W: In an ordinary machine without any jig or fixture	200,000.00	5000.00
JF : In an ordinary machine but with jig or fixture	3,00,000.00	2500.00
A: In automatic special purpose machine	6,00,000.00	1000.00

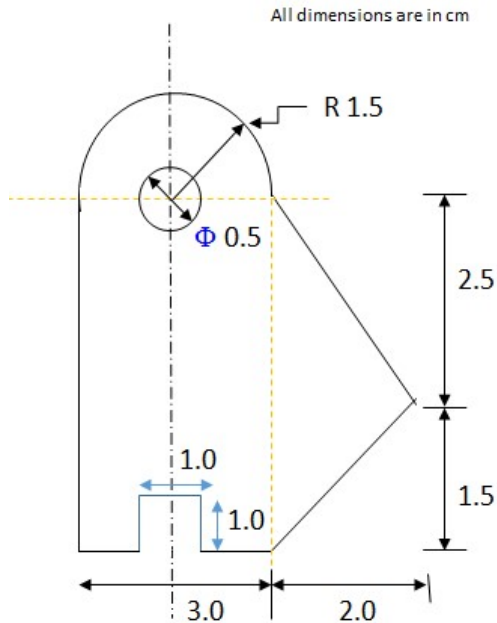
Identify the most appropriate mode and comment on whether the use of the jig/fixture is justified.

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|--|-------|-----|
| Q.2(a) (i) What is a datum, and why it is important in the locating principle?   | [2.5] | 2 5 |
| (ii) What is the role of TENNONS in the milling fixtures?  | [2.5] | 2 5 |
| Q.2(b) Proposed a suitable jig to drill holes 1 and 2 in the given product. Justify the locating and clamping methods used by you. | [5]   | 2 6 |



PTO

- Q.3(a) Design a progressive die for the figure given below. The material is 2mm thick cold-rolled C40 steel for which the maximum shear strength can be taken as 550 MPa,  
 a) Calculate the Centre of Pressure  
 b) Calculate the Press- tonnage



- Q.3(b) With suitable example(s), explain the principles for stock strip layout development in sheet metal working.
- Q.4(a) Find the blank diameter of an 80 mm outside diameter x 110 mm high x 1 mm thick cup with the following corner radii [5] 4 6  
 (a) 7  
 (b) 5
- Q.4(b) Explain the steps involved in forging a connecting rod with suitable diagrams. [5] 4 5
- Q.5(a) In a rough turning operation with a straight shank brazed tool of rectangular section mounted with an overhang of 60mm, the main cutting force was found to be 232 kgf. The tool body is made of carbon steel having permissible bending strength  $\sigma_{bp} = 20 \text{ kgf/mm}^2$  and modulus of elasticity  $E = 2 \times 10^4 \text{ kgf/mm}^2$ . If the permissible deflection of the tooltip is  $\delta_p = 0.1 \text{ mm}$ , determine the tool dimensions. Assume,  $H=1.6B$  [5] 5 6
- Q.5(b) Make a sketch of a milling cutter and label all parts. Distinguish between relief, primary, and secondary clearance angles on the cutter tooth. What is the purpose of each? [5] 5 5

:::25/04/2023:::M