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

CLASS: BE **SEMESTER : VI**
BRANCH: PRODUCTION **SESSION : SP/18**

SUBJECT: PE6001 TOOL DESIGN

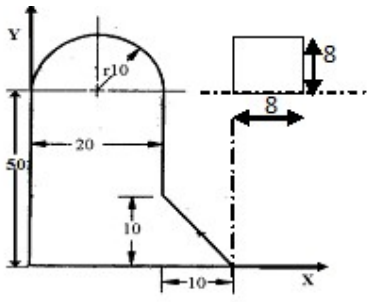
TIME: 3 HOURS **FULL MARKS: 60**

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.

Q.1(a) Distinguish between jigs and fixtures. [2]
Q.1(b) Discuss the general design principles to be followed for the design of locators. [4]
Q.1(c) Sketch and describe a rack and pinion clamp used for a drilling jig. Explain its locking mechanism. [6]

Q.2(a) What is indexing? Differentiate between linear and rotary indexing. [2]
Q.2(b) With the help of neat diagram explain the principal of operation of a jig which can be used to drill holes in more than one surfaces of a work piece. [4]
Q.2(c) Sketch and describe a milling fixture to machine slots on the circumference of four hollow cylindrical pins at a time. [6]

Q.3(a) How does a compound die differ from a combination die? [2]
Q.3(b) A work shop owns a 100 T press the cutting force required for making washer using a progressive die is 120T (90T and 30T)? Explain at least two methods by which you can use the same press for the operation. [4]
Q.3(c) What is centre of pressure? Discuss its utility. Calculate the centre of pressure of the given component. [6]



Q.4(a) How much cutting force is required to pierce a part with two holes, one is 6cm square and another is circular with 6cm diameter, from 2mm thick plate. The shearing strength of the material is 1.6 tons/cm^2. [2]
Q.4(b) What is clearance? On what factors clearance between die and punch wall depends in blanking and piercing? Discuss the effect of excessive clearance and insufficient clearance on blanking and piercing operation. [4]
Q.4(c) A washer 1.25 mm thick, 12 mm hole and on outside diameter of 25 mm in to be made from a material whose ultimate shearing strength is 3.8 kg/cm^2. Calculate: [6]

i. The force needed to produce the washer if both the punch operates at the same time with no shear.
ii. The force needed if only one punch operates at a time (that is, they are staggered).
iii. The force needed in part ii), if punch has a shear of 1.0 mm, on the assumption of 50% penetration.
iv. The striping force needed in part (i).

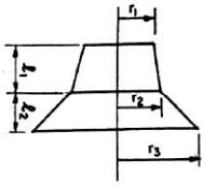
Q.5(a) What is a form tool? Discuss it advantages and limitations. [2]
Q.5(b) With the help of neat diagram discuss the different elements of a single point cutting tool. [4]

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Q.5(c) A 10° back rake tool is used for machining on a lathe at a speed of 60 m/minute. The diameter of the work piece is 100mm. Find the cross-section of rectangular tool shank if the maximum permissible deflection at the tool point is 0.012mm and the maximum allowable stress in the tool shank is 7.5 kg/mm2. Assume a rectangular shank with height to width ratio 1.6 and the tool overhang as 1.3 times the height. The recorded value of the cutting force under these processing conditions is 250 kg. Assume young's modulus as 20 X 103 kg/mm3 [6]

Q.6(a) Discuss in brief important elements of a drill that are to be taken care of while designing a drill. [4]

Q.6(c) Design a flat form tool for the given work piece and write the procedure. Given r1 = 20, r2= 30, r3 =45, l1=20, l2 = 25. Rake angle = 20° and relief angle = 25°. [8]



Q.7(a) In a particular case the following data is obtained: [2]

Machining cost using existing equipment: Rs. 60.00
Machining cost using special equipment : Rs. 20.00
Cost of special equipment: Rs. 8000.00

Find the minimum number of components to be machined to justify its use.

Q.7(b) Discuss some of the factors which govern the selection of a tool material. [4]

Q.7(c) Discuss the materials used for the designing of single point cutting tool. Write their properties and application. [6]

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