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University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF EDUCATION IN ENGINEERING TECHNOLOGY

COURSE CODE: MIE 462

SPECIAL / SUPPLEMENTARY PAPER

COURSE TITLE: DESIGN OF JIGS AND FIXTURES

DATE: 3/10/2022 **TIME:** 9:00 AM – 11:00 AM

INSTRUCTIONS TO CANDIDATES

Answer question ONE (1) as compulsory, and any other TWO(2) optional questions

Answer TWO (2) other questions

DURATION: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over

QUESTION ONE **(30 marks)**

Q1(a) Explain NINE basic purposes of developing and using suitable jigs and fixtures for batch production in machine shops: **[3]**

Q1(b) Explain what locating means in the context of jigs and fixtures. **[3]**

Q1(c) Illustrate the following locators mounted in neatly labeled sketches: **[6]**

(i) conical locator
(ii) cylindrical locator
(iii) a pin and vee-block locator

Q1(d) Explain the working principle of a differential clamp ,in fig. 1(d), equipped with an operating cam.

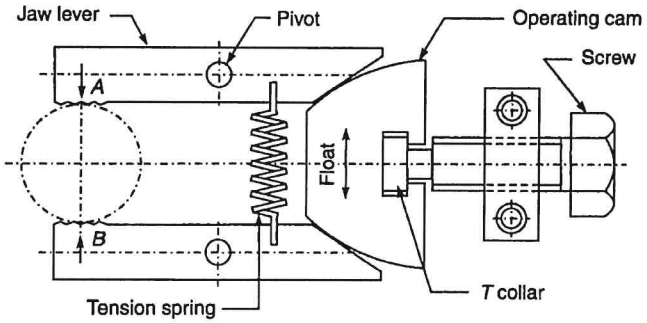

Fig. 1(d) Differential clamp equipped with an operating cam

Q1(e) Illustrate a clamping jig and fixture of a cylinder on a vee-block ready for drilling of a hole 8 mm diameter located 30 mm from one end of the cylinder. Show how the guide bushes are mounted above the cylinder. Provide 3 views. **[10]**

Q1(f) What EIGHT basic requirements are laid a good clamping device? **[4]**

QUESTION TWO **(20 marks)**

Q2(a) With the help of a diagram differentiate between an equalizing clamp and a centralizing clamp.

Q2(b) Name **FIVE** advantages of a multiple lever clamping fixture. **[5]**

Q2(c) Consider the diagram , in figure Q2, showing a multi lever clamping system of forces: P1, P2, P3, P4 ; force F is exerted on one end of the clamp lever by a load of 120 kg . In the Multi lever , clamping system shown, segments AB =L, JB = X , and P1, P2, P3, P4 represent reaction forces arising from the action of force F as shown in the diagram. Using the designation given ,prove that the pressure exerted at link pins C, D, E of the clamp is equal in each of them. Likewise, show that the pin pressure at link G is 2 times that acting on each of the links C, D, E. **[12]**

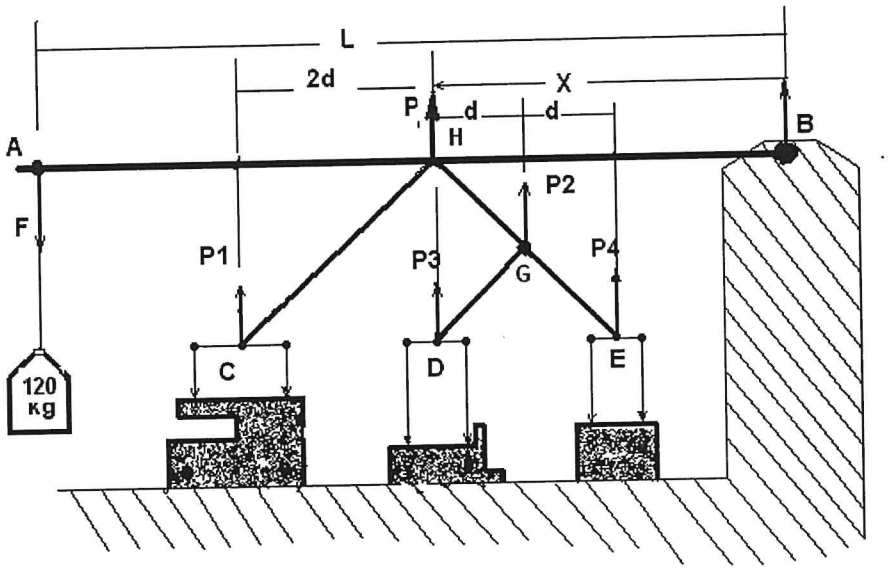

Fig.Q2 multi-lever clamping system

QUESTION THREE **(20 marks)**

Q3(a) With sketches, illustrate the design of TWO types of cam clamps and TWO types of Screw operated strap clamps. **[10]**

Q3(b) Suggest ways of altering the common machine manual vice to an automatically operated hydraulic one in order to ease the process of clamping and unclamping monotonously. Explain the hydraulic circuit of this redesign. **[10]**

QUESTION FOUR **(20 marks)**

Q4(a) Sketch the principle design of a jig to facilitate batch production by milling of the slotted bush shown in figure 4. **[14]**

Q4(b) Explain the technical procedure of producing the equidistant slots. **[6]**

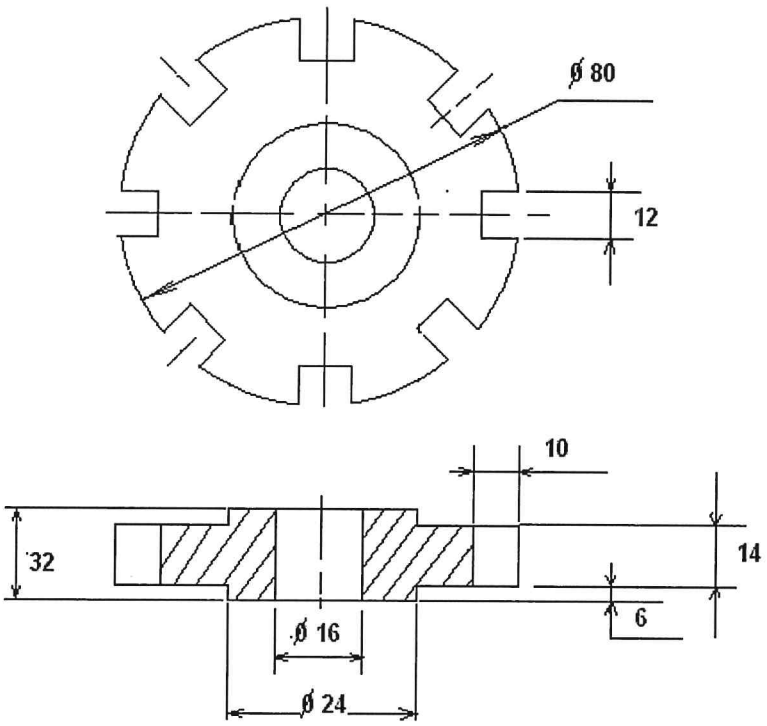

Figure 4