



TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

UNIVERSITY EXAMINATIONS FOR DEGREE IN
BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

EMG 2401: INDUSTRIAL HYDRAULICS

SUPPLEMENTARY/SPECIAL EXAMINATIONS

SERIES: MARCH 2014

TIME: 2 HOURS

INSTRUCTIONS:

- You should have the following for this examination:
 - i) Drawing instruments
 - ii) Electronic calculator
- This paper consists of **FIVE** questions.
- Answer Question **ONE (Compulsory)** and any other **TWO** questions.

This paper consists of Three printed pages

QUESTION 1 (Compulsory)

- a) Illustrate the operation of the following types of cylinders as used in hydraulic systems:
 - i) Double rod cylinder
 - ii) Single acting cylinder with springWith the aid of a sketch, explain the construction of a Tie-Rod cylinder. (10 marks)
- b) i) differentiate a Relief valve from a sequence valve in pressure control valve.
ii) Outline the FOUR variables upon which the flow of hydraulic fluid depends on in a Throttle valve. (10 mark)

QUESTION 2

- a) i) Outline any FOUR desirable properties of a hydraulic fluid.
 ii) Explain the cause of sludge in a hydraulic fluid and its effects on a hydraulic system. (11 marks)
- b) I) List FOUR factors considered when selecting a hydraulic pump for a particular application.
 II) With the aid of sketches explain the construction and operation of following hydraulic pumps.
 i) Internal gear pump
 ii) Balanced vane pump. (9 marks)

QUESTION 3

- a) Define the following terms in connection with the flow of a liquid:
 i) Uniform flow (2 marks)
 ii) Steady flow (2 marks)
 iii) Unsteady flow (2 marks)
 iv) Mean velocity (2 marks)
 v) Discharge (2 marks)
 vi) Mass flow rate (2 marks)
- b) A hydraulic hose with internal diameter of 0.025 is carrying oil with kinematic viscosity $5.0 \times 10^{-5} \text{m}^2/\text{s}$ at a flow rate of $0.00126^3/\text{s}$. calculate the Reynolds number and determine if the flow is laminar or turbulent. (5 marks)
- c) $10 \text{m}^3/\text{h}$ of water flows through a pipe of 100mm inside diameter. The pipe is later reduced to an inside dimension of 80mm. calculate the flow velocity in each section of the pipe. (3 marks)
 i) Turning a short taper using a formed tool
 ii) Compound slide technique. **(7 marks)**

QUESTION 4

- a) i) State the Pascal's law as applied to hydraulics.
 ii) Explain FOUR functions of a hydraulic fluid in a hydraulic system. (5 marks)
- b) I) Name TWO types of Hydraulic pump in each of the following categories:
 i) Non positive displacement
 ii) Positive displacement
 II) With the aid of a sketch, explain the operation of a lobe pump. (7 marks)
- c) A pipeline connecting two reservoirs having a difference of level of 6m is 720m long, and rises to a height of 3m above the upper reservoir at a distance of 240m from the entrance before falling to the lower reservoir. If the pipe is 1.2m in diameter and the frictional coefficient and the pressure at the highest point of the pipeline? **(8 marks)**

QUESTION 5

- a) i) Explain what is meant by 'safe edge' on a file and why it is necessary.
 ii) Explain briefly the correct use of files. **(10 marks)**

- b) i) With the aid of a sketch show the parts of a hacksaw.
ii) State the type of blades available for hacksaws.
iii) Explain how blades are fitted on frame.

(10 marks)