



# THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

*Faculty of Engineering and Technology*

DEPARTMENT OF MECHANICAL & AUTOMOTIVE ENGINEERING

INSTITUTIONAL BASED PROGRAMME

BACHELOR OF ENGINEERING IN MECHANICAL ENGINEERING  
YEAR III SEMESTER I

EMG 4307 MACHINE DESIGN II

NOVEMBER 2011 SERIES

**TIME: 2 HOURS**

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## INSTRUCTIONS:

1. You should have the following for this examination  
- *Answer booklet*
2. Answer Question **ONE** and ANY other **TWO** Questions.
3. Maximum marks for each part of a question are as shown.

## QUESTIO ONE

- (a) (i) Define refrigeration
- (ii) A vapour compression refrigerator using R 12 works between temperature limits of  $-5^{\circ}$  and  $40^{\circ}$ . The refrigerant leaves the compressor dry saturated. Calculate the refrigeration effect and the coefficient of performance if the refrigerant leaves the condenser saturated. (10 marks)
- (b) List and describe **TEN** parameters to be considered when selecting a pump for a particular purpose. (10 marks)

### QUESTION TWO

- a) Using diagrams explain the vapour compression refrigeration cycle stating clearly the function of each component. (10 marks)
- b) State **TWO** possible causes of each of the following pump malfunction.
- i) No liquid delivered
  - ii) Not enough liquid delivered.
  - iii) Pump discharge pressure low
  - iv) Pump overloads drive
  - v) Stuffing box overheats. (10Marks)

### QUESTION THREE

- a) (i) Explain the term refrigerant as used in refrigeration.
- (ii) State any FIVE properties of a good refrigerant.
- (iii) Differentiate between primary and secondary refrigerants (10 marks)
- b) With the aid of a well labeled sketch, describe in point form the operation of a centrifugal pump. (10 marks)

### QUESTION FOUR

- a) (i) State **TWO** main groups of material handling equipment.
- (ii) State any **FIVE** factors to consider when selecting any type of material handling equipment
- (iii) State any **THREE** safety devices installed on conveyors (10 marks)
- b) (i) State TWO main functions of a pump casing.
- (ii) State and describe the TWO types of pump casing
- (iii) List THREE types of pump impellers.
- (iv) Describe cavitation with reference to pumps. (10 marks)

### QUESTION FIVE

- a) (i) Explain using diagrams the basic principle of a belt conveyor.

- (ii) State any **THREE** advantages of vibrating conveyors. (10 marks)
- b) You are in charge of the pumping system in a plant. State **TEN** most important steps you will take to improve energy efficiency of pumps and the pumping system in the plant. (10 marks)