



**THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

***Faculty of Engineering & Technology***

**DEPARTMENT OF MECHANICAL AND AUTOMOTIVE ENGINEERING**

**DIPLOMA IN MECHANICAL ENGINEERING (PLANT OPTION)**

**STAGE III SEMESTER II EXAMINATIONS**

**APRIL/MAY 2010 SERIES**

**PLANT AND WORKS SERVICES DRAWING**

**TIME: 2 HOURS**

**Instructions to Candidates**

You should have the following for this examination:

- Answer Booklets
- Scientific Calculator
- Colour Pencils
- Drawing instruments
- A2 Drawing Paper

This paper consists of **THREE** Questions in **TWO** Sections **A** and **B**. Answer Question in Section **A** and any **ONE** Question from Section **B**. Maximum marks for each part of a question are shown.

## **SECTION A : (PLANT DRAWINGS)**

### **Question ONE : (COMPULSORY)**

A processing plant for tea leaves is to be set up. The products will be; black tea, green tea, oolong tea and instant tea. The plant is to be located within a vast tea plantations and will incorporate the following production units:

#### **A : Black Tea Plant**

- Withering tats - Tea leaves spread to remove moisture and make them flaccid.
- 1<sup>st</sup> stage rollers - Leaves pressed to rupture their cells also rubbed to release juices.
- 2<sup>nd</sup> stage rollers - Leaves twisted and coated with released juices, leading to balling and change of colour to bright copper: tea aroma also develops.
- Roller breaker - Where formed balls are disintegrated to facilitate formation allowing for oxidation and enzyme action.
- Fermentation bed - Rolled leaves spread to depth of 5-8 cms and held under high humidity.
- Drier - Fermented leaves passed through drying chambers to arrest Fermentation and develops blackish colour.
- Heater - Leaves heated further to case harden and protect tea quality.
- Sieve/grader
- Packaging machine - Leaves packed into foil lined tea chests and sealed to protect from moisture.

#### **B : Green Tea Plant**

- Stream Chamber - where freshly plucked leaves are steamed to soften and make pliable.
- Two Roller/drier- Leaves rolled and dried alternately to make stiff.
- Drying pan - Where leaves for export refired and mechanically stirred to produce luster.
- Sieve/grade
- Packaging Machine

#### **C : Oolong Tea Plant**

- Rolling room - Sun withered leaves gently rolled in plucked hands which initiate mild fermentation at the plantations.
- Fermentation Bed- Limited fermentation allowed.
- Drier
- Packaging Machine - Leaves packed for shipment

**D : Instant Tea Plant**

- Extracting towers - Where liquid tea is made from part of black tea and hot water.
- Hydrolyzing pressure vessel - Concentration of tea solution increased.
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- Filters - Tea brew passed through to remove solids.
- Spray drier - Dry hot air passed through a chamber in which concentrated tea brew is sprayed. Moisture escapes and hollow small tea balls are formed.
- Packaging under vacuum –The dry tea balls are packed in a vacuumed containers to keep off moisture.

Draw in good proportion a layout of the processing plant and include all the required services.

**(40 Marks)**

**SECTION B : ANSWER ANY ONE QUESTION FROM THE SECTION**

**Question TWO**

- (a). Using graphical symbols draw a hydraulic circuits which incorporate the following:
- (i). Power Unit
  - (ii). One main pilot operated relief valve.
  - (iii). One double acting cylinder
  - (iv). Three pressure gauges
  - (v). One 4/2-way directional control valve.
  - (vi). On one-way throttle valve.
- (8 Marks)**
- (b). Draw a downward and upward type mechanical ventilation for a departmental store.
- (6 Marks)**
- (c). Draws a one-line diagram of cold water supply to a multi-storey building to include the following units:
- (i). Duplicated pump
  - (ii). Break astern
  - (iii). Break pressure storage cistern
  - (iv). Drinking water cistern
- (6 Marks)**
- (d). Discuss the role of maintenance in production planning and control system.
- (2 Marks)**

### **Question THREE**

(a). Draw a two-line compressed air supply system to the following points clearly indicating the conditioning units for each:

- (i). Spray gun
- (ii). Percussive tool
- (iii). Drain points
- (iv). Separator

**(7 Marks)**

(b). Draw a schematic diagram of a pass-out turbine system that incorporate steam supply to process and also including the following:

- (i). Reducing valves
- (ii). Duxer
- (iii). Condenser
- (iv). Feed pump

**(7 Marks)**

(c). Draw a chemical fire extinguisher installation for a boiler room which includes the following units among others:

- (i). Chemical tank
- (ii). Alarm switch
- (iii). Supply line pipe
- (iv). Supply nozzle
- (v). Fusible plug

**(6 Marks)**