MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL

ENGINEERING

PLANT ELECTRICALS

DATE: TIME:

INSTRUCTIONS:

*-The paper consist of **FIVE** questions*

-Answer question one carries 30 Marks and is compulsory.

*-The other **FOUR** questions carry equal marks each 20 marks*

1   a)   Give **FIVE** advantages of electrical braking over mechanical   (5 marks)

     b)   Describe **THREE** methods of electrical braking using neat sketches   (9 marks)

     c)   Explain the following methods of speed control in d.c machines

           i)   Flux control

           ii)   Rheostatic control

           iii)   Wards-leonard system   (12 marks)

     d)   A 220v, 15Kw, 850 r.p.m shunt motor draws 72.2A when operating at rated condition. The resistances of the armature and shunt field are 0.25Ω and 100Ω respectively. Determine the percentage reduction in flux to obtain a speed of 1650 r.p.m when armature current drawn is 40 A   (4 marks)

2   a)   With aid of sketches differentiate compound wound long short shunt motors

     b)   A short shunt compound generator delivers a load current of 30A at 220 v, and has armature, series-field and shunt-field resistances 0.05Ω, 0.3Ω and 200Ω

respectively. Calculate the induced E.M.f and the armature current. Allow 1V per brush for contract drop. (6 marks)

c) i) Illustrate power stages of a d.c motor (4 marks)

   ii) A 500V d.c shunt motor takes a current of 5A on load. The resistance of the armature and field circuit are 0.22 ohm and 250ohm respectively. Find the efficiency when loaded and taking a current of 100A. (6 marks)

3 a) Explain the following types of motor rating

   i) Short time

   ii) Intermittent

   iii) Continous (6 marks)

b) A certain motor has to perform the following duty cycle:

   - 100 Kw for 10mm

   - No-load for 5 Min

   - 50Kw for 8 min

   - No-load for 4 min

The duty cycle is repeated indefinitely. Draw the curve for load cycle and determine a suitable size motor continuously rate (8 marks)

c) Draw heating and cooling curves for

   i) Motor continuously worked on full load

   ii) Motor run for short time. (6 marks)

4 a) Explain load equalization (4 marks)

b) The initial temperature of a machine is 45^0c. Calculate the temperature of machine after 1.2 hours, if its final steady temperature rise is 85^0c and the heating time constant is 2.4 hours .Ambient temperature is 25^0c (6 marks)

c) Describe the construction of a d.c machine (10 marks)

5. a) i) what is the importance of d.c machines (3 marks)

   ii) Explain the necessity of motor starter (6 marks)

   b) Show that transformer equation is given by E=4.44fNIM, where

   E – Induced emf (6 marks)

   f –Frequency applied

   N – Number of Turns

ϕ –maximum flux.

c)   Using neat Sketches explain the following parts of power transformers

    i)   Breather   (5 marks)

    ii)   Buchholz Relay

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL

ENGINEERING

INSTRUMENT SYSTEM

DATE: **TIME:**

INSTRUCTIONS:

-This paper consist of Five questions

-Answer question One& any Two question

-Question One carries 30 marks and its Compulsory

-The other four questions carry equal marks each 20 marks.

1   a)   Define the following as applied to analog to digital converters (ADC)

          (i)   Resolution

          (ii)   Speed   (2 marks)

     b)   An analog transducer with a 0-10V input is able to distinguish a change of n10mV in its input signal determine

          (i)   Resolution

          (ii)   Number of bits of an A/D converter to have the same resolution as the traducer

          (iii)   Quantization interval

          (iv)   Quantization noise

          (v)   The number of decision levels   (12 marks)

c)   i)   with a Aid of block diagram explain the elements of telemetry system giving function of each   (9 marks)

               ii)   Using sine wave form distinguish between amplitude and frequency modulation.   (7 marks)

2.   a)   Explain the need for modulation   (3 marks)

        b)   Briefly explain the following A/D conversation techniques

               i.   Potentiometric converter

               ii.   Ramp converter

             iii.   Integration converter

        c)   Explain Two Main advantages of differential amplifier   (5 marks)

3.   a)   show the $Vo=A_d(v_2 - v_1)$ for the following differential amplifier   (5 marks)

        b)   A differential amplifier with common mode input of 500mV and a difference mode input of 30mV has an input of 5mV due to the common mode input and 3V due to difference mode input. Find the difference mode and common mode gain. Find also the common mode rejection ratio   (9 marks)

        c)   Using circuit diagrams explain the function of the following components in a signal conditioning system.

               i.   Filter

               ii.   Attenuators   (5 marks)

4.   a)   Using circuit explain the fo0llowing operational amplifier circuits

               i.   Inverter

               ii.   Adder

             iii.   Multiplier

              iv.   Integrator

               v.   Differentiator   (10 marks)

        b)   An inverting OPAMP has a resistance of 100 KΩ in its feedback Path an a resistance of 1 KΩ at its input terminals, calculate.

               i.   Gain

               ii.   If the OPAMP is to be built with its input resistance 10KΩ.what should be the value of feedback resistance if it acts as a multiplier with a factor of 10.   (10 marks)

5. a) Mention the hazards of land line telemetering system   (3 marks)

   b) Distinguish between Time division and frequency division multiplexing methods

                                                                              (8 marks)

   c) With aid of diagram explain the elements of digital data acquisition system

MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL ENGINEERING

WORK SERVICE & MAINTENANCE DRAWING

DATE: TIME:

INSTRUCTIONS:

- *This paper consist of FIVE questions*
- *Answer question ONE & any TWO question*
- *Question One carries 30 marks and its Compulsory*
- *The other FOUR questions carry equal marks each 20 marks.*

1. a)   Draw a line layout of steam plant including all the accessories   (10 marks)

    b)   Using a **TWO** line diagram illustrate the typical steam distribution layout from steam main up to line of use. Show how to trap condensate steam   (12 marks)

    c)   Sketch the following pipe joints

         i.   Manupulative

         ii.   Non-manupulation   (8 marks)

2   a)   Draw a one-line,layout of the following single stage refrigeration plants

         i.   Vapour compression

         ii.   Vapour absorption   (10 marks)

    b)   Draw sectional views of the following safety valves

         i.   Dead weight

| | | ii. | Spring type | (6 marks) |

    c)   Draw a sectional view of a heating/cooling room air conditioner   (4 marks)

3   a)   Draw a layout diagram of a heating/cooling room air conditioner   (6 marks)

    b)   Draw sectional views of the following air filters

         i.   Electrostatic filter

         ii.   Automatic viscous(oil-spray type   (8 marks)

    c)   Draw a steam circuit diagram for heating a building with fore radiators, where **FIVE** radiators, where FOUR radiators will be high pressure steam and the flash steam is received to heat the fifth   (6 marks)

4   a)   With aid of a two-line circuit diagram, show a compressed air main supplying air to operate a spray gun and a breathing mask. Include two drain connections.

                                                                  (10 marks)

    b)   Draw the following cold/heat water distribution components

         (i)   Expansion joint

         (ii)   Sectional view of flanged joint of steel pipe.

         (iii)   Sectional view of an equilibrium ball valve (Croydon type)

         (iv)   Tee-elbow

         (v)   Lateral   (10 marks)

5   a)   Draw sectional diagrams of the following water valve

             i.   Screw down step valves

             ii.   Pressure relief valve   (8 marks)

    b)   Draw a one line diagram of an indirect hot water supply system incorporating the following:

             i.   Expansion and feed water cistern.

             ii.   Indirect hot water cylinder

             iii.   Washing basins and sinks

             iv.   Drain valves   (8 marks)

             v.   Secondary cold water feed pumps

             vi.   Vents

    c)   Draw a slow sand water filter   (4 marks)

MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL AND MANUFACTURING ENGINEERING

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN MECHANICAL ENGINEERING

PLANT THEORY &PRACTICE

DATE: **TIME:**

INSTRUCTIONS:

-This paper consist of five 5 question

-Answer question ONE and any other TWO questions

-Question one carries 30 marks and its compulsory

-The other four questions carry equal marks each (20 marks)

1.   a)   Outline the composition of the following types of refrigerants and state one example for each the following.

      i.   Blends

      ii.   A zoetrope's

      iii.   Hydro carbons   (9 marks)

    b)   With an aid of plant, T-S and P-H diagrams, explain the effect of the following process in vapor   compression refrigeration system

      i.   Superheating

      ii.   Undercooling

      iii.   Use of heat exchanger   (12 marks)

    c)   A vapour comprehension refrigeration system is using refrigerant R717 and has an evaporator temperature of $-2^0 C$ and condenser temperature of $26^0 C$. The

---

refrigerant is superheated to 50K in the compressor and under cooled by 6K in the condenser. Assuming isentropic compression.

    i)   Draw plant, p-h and Ts diagram   (3 marks)

    ii)   Determine C.O.P r and C.O.P carnot of the system   (6 marks)

2.   a)   Distinguish between Primary and secondary refrigerants   (5 marks)

    b)   Give five desirable properties of a refrigerant   (5 marks)

    c)   A refrigerator circle whose isentropic efficiency is 0.84 uses R12 as the refrigerant. The temperature of refrigerant in the evaporate is -20^0 C and in the condenser is 40^0 C and .The refrigerant is calculated at a rate of 0.3kg/s. The refinement leaving the condenser is undercooled by 5, while entering the compressor is saturated vapour determine.

        (i)   C.O.P$_R$

        (ii)   C.O.P carnot

        (iii) Capacity of the plant   (11 marks)

3.   a)   Outline any Three impurities found in the natural water that have to be removed as part of boiler feed water treatment and explain the consequences if not removed   (8 marks)

    b)   Mention the sources of air leakages in steam condenser and explain its effect on the condenser performance   (8 marks)

    c)   Give Four requirements of an ideal condenser which contribute to its increased efficiency   (4 marks)

4.   a)   Explain the four factor factors to be considered when selecting a material handling equipment   (4 marks)

    b)   With aid of sketches, describe the construction and operation of the following:-

        (i)   Vibrating conveyer

        (ii)   Bucket conveyer   (10 marks)

    c)   With the aid of a diagram, explain the construction and operation of an electrostatic Precipitator used in dust control   (6 marks)

5.   a)   Illustrate the typical steam distribution layout and explain the function of all the Components.   (10 marks)

    b)   Explain Five problems associated with steam distribution   (5 marks)

    c)   List Five maintenance checks, carried on cooling towers   (5 marks)