



OLABISI ONABAJO UNIVERSITY  
COLLEGE OF ENGR'RG AND ENVIRONMENTAL STUDIES IBOGUN CAMPUS  
**DEPARTMENT OF MECHANICAL ENGINEERING**  
*RAIN SEMESTER EXAMINATION (2019/2020 Session)*

**COURSE:** MEG 407: HEAT AND MASS TRANSFER

**INSTRUCTION:** Attempt Question-1 and any other 2 questions.

**TIME ALLOWED:** 2 hours

**DATE:** Aug 19th, 2021

1. A steel pipe having an inside diameter of 1.88 cm and a wall thickness of 0.391 cm is subjected to inside and outside surface temperature of 367 and 344 K, respectively. Find the heat flow rate per meter of pipe length, and also the heat flux based on both the inside and outside surface areas. (15 marks)
2. A furnace wall has three layers, 10 cm of firebrick ( $k = 1.560 \text{ W/mK}$ ), followed by 23 cm of kaolin insulating brick ( $k = 0.073 \text{ W/mK}$ ), and lastly 5 cm of masonry brick ( $k = 1.0 \text{ W/mK}$ ). The temperature of the inner wall surface is 1370 K and the outer surface is at 360 K. What are the temperatures at the contacting surfaces? (20 marks)
3. Saturated steam at 0.276 MPa flows inside a steel pipe having an inside diameter of 2.09 cm and an outside diameter of 2.67 cm. The convective coefficients on the inner and outer pipe surfaces may be taken as 5680 and  $22.7 \text{ W/m}^2 \cdot \text{K}$  respectively. The ambient air is 294 K. Find the heat loss per meter of bare pipe and for a pipe having a 3.8 cm thickness of 85% magnesia insulation on its outer surface. (20 marks)
4. Explain the following briefly: Conduction, convection and radiation. (9 marks)  
The wall of an industrial furnace is constructed using 0.15 m thick fireclay brick having a thermal conductivity of  $1.7 \text{ W/m} \cdot \text{K}$ . At Steady state operation, measurement revealed temperature of 1400 and 1150 K at the inner and outer surfaces respectively. What is the rate of heat loss through the wall that is 0.5 m by 1.2 m on a side? State your assumptions. (11 marks)
5. Light lubricating oil ( $c_p = 2090 \text{ J/kg} \cdot \text{K}$ ) is cooled by allowing it to exchange energy with water in a small heat exchanger. The oil enters and leaves the heat exchanger at 375 and 350 K, respectively, and flows at a rate of 0.5 kg/s. Water at 280 K is available in sufficient quantity to allow 0.201 kg/s to be used for cooling purposes. Determine the required heat-transfer area for (a) counterflow and (b) parallel-flow operations. The overall heat-transfer coefficient may be taken as  $250 \text{ W/m}^2 \cdot \text{K}$ . (20 marks)



COURSE: MEG 405: Applied Fluid Mechanics  
INSTRUCTION: Attempt Question one (1) and any other two (2) questions

TIME ALLOWED: 2 hours

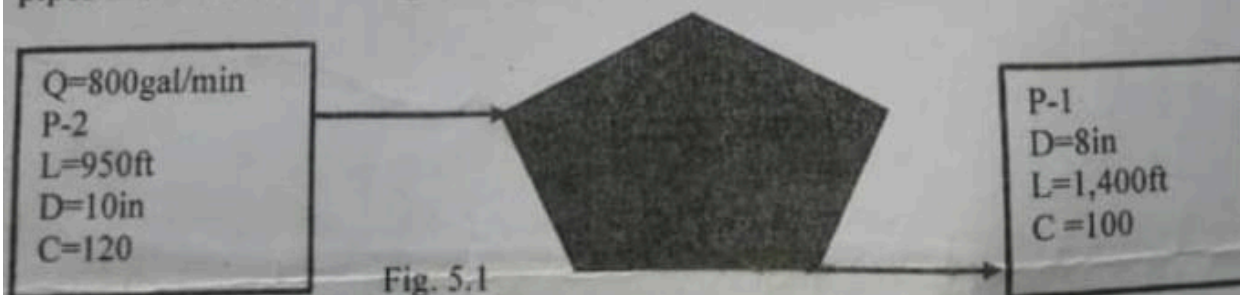
DATE: August 27th, 2021

### SECTION A

- 1.
- (i). Mention two types of pipe network 2 marks  
(ii). Give two characteristics of network classifications 3 marks
  - (i) Mention three types of fluid flow problem in pipe analysis 3 marks  
(ii) Define the head loss and give expression for major and minor losses in pipe network analysis. 5 marks
  - Air flow steadily through a horizontal pipe of 20 cm diameter and exit at a pressure of 80 Pa through an 18 cm diameter nozzle. The inlet pipe pressure of 800 Pa. what is exit velocity? 7 marks

### SECTION B

- 2.
- Show that head loss in a parallel pipe is the same that is  $H_{L1} = H_{L2}$  5 marks
  - (i) Mention two main types of pumps and describe them 3 marks  
(ii) States four types of pump head 2 marks
  - (i) Draw with details a typical pump performance curve 5 marks  
(ii) Mention three forms of fans and blowers 5 marks
- 3.
- Show a detail drawing of a compressor, describe its operations and functions. 10 marks
  - Mention three common problems of a compressor and their solution 10 marks
- 4.
- Describe in details fluid power machinery 5 marks
  - Mention 3 advantages and six application areas of fluid power system 5 marks
  - (i) Mention two types of fluid power system 5 marks  
(ii) Mention 6 properties of a hydraulic fluid and explain them 5 marks
- 5.
- Mention three components of an hydraulic control components 3 marks
  - (i) Describe one trouble / fault of a pump, probable cause, and possible remedial actions 2 marks  
(ii) Describe one trouble / fault of a compressors, probable cause and possible remedial actions 3 marks
  - Figure 5.1 presents parallel pipes channeling fluid into a container if the details of the pipes are as show on the figure. Calculate the mass flow rate  $Q_1$  and  $Q_2$  12 marks







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**DEPARTMENT OF MECHANICAL ENGINEERING**  
DEGREE EXAMINATION (2020/2021 Session)

**COURSE:** FEG 405: Research Methodology

**INSTRUCTION:** Attempt ALL Questions in Part A and any other TWO in Part B

**TIME ALLOWED:** 2 hours .

**DATE:** August 18, 2021

**INSTRUCTION**

- a. You have been given a soft copy file (tagged FEG 405 RAIN-SEMESTER EXAM DATA). The file contains the data collected from 50 students of Engineering Faculty in IboGUN campus through a developed close-ended research questionnaire. The aim for the study is to assess the contributions of students' cell phones to their academic performances. Use the data to answer all relevant questions.
- b. Provide your answers in the **Answer Booklet** provided. You may draw relevant Tables and Figures from your SPSS output window to support your answers.

**PART A**

1. With illustrations outline the classifications of engineering research study design

- a. Outline three relevance of SPSS statistics in engineering survey research
- b. i. Briefly state three differences between Data view window and variable view window in SPSS  
ii. Mention two characteristics identified with the two variables mentioned in "ci" above
- c. Outline three different methods of data presentation in engineering research

3 m  
6 m  
3 m  
2 m  
6 m

2. Using the reported "Numbers of Carry Overs (NCO)" as dependent variable, conduct regression analysis to find out the relationship between the (a) purpose for using phone during lectures (b) hours spent on cell phone (c) time spent on actual reading (d) game play with cell phone and (e) level of distraction from learning caused by cell phone. Use unstandardized as your predicted values. Hence,

- i. What is the mean and standard deviation of the Predicted Value
- ii. Is there any difference in the contribution of the predictors to the NCO?
- iii. Sketch the best fit scatter plot for the model
- iv. Use the unstandardized coefficients, write out a regression equation for the model
- v. Which of the predictors will you identify as having greatest influence on the level of NCO?

**PART B**

3. Provide answer to this research question;

- a. Is there any correlation between the use of cell phones for academic purposes and students' reported numbers of carry overs?
- b. How may you interpret the output in "a"

4. With T-test statistics, compare the means of the monthly allowances given to students of the Faculty of Engineering and the amount they expended on cell phones.

- a. If equal variances not assumed, how will you interpret the outcome of your result?

5. Is any association between the responses of male and female students on whether they would have performed better if not for the negative influence of their cell phones?

- a. Will you conclude from the output in "a" above that wrong use of cell phone among students is the main cause of the reported poor academic performance? Explain

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# OLABISI ONABANJO UNIVERSITY

College of Engineering and Environmental Studies, Ibogun campus  
Faculty of Engineering  
Department of Civil Engineering  
2020/2021 Harmattan Semester Examination

Course Title: Technical Communications

Time Allowed: 2 hours

Instruction: Answer all questions in section one and any other one in section two (four questions in all)

Course code: FEG 401

Unit: 1

## SECTION ONE

### QUESTION ONE

(a). The relationship between duration,  $x$  (minutes) and rainfall intensity,  $y$  (mm/hr) values for a 10 and 100 year return period is given as:  $y = 1475 x^{-0.573}$ . Use the equation in Microsoft excels spreadsheet to generate intensity values for 5, 10, 15, 20, 30, 45, 60, 90, 120, 180, 240, 300 and 420 minutes and present the result in a standard tabular form (5 marks)

(b) Use Microsoft excels to plot a graph of intensity versus duration for the Table developed in (a) (7.5 marks)

(c) Generate the logarithmic equation relationship for the plotted graph of (b) and comment on the  $R^2$  value (5 marks)

### QUESTION TWO

Use the table generated in question 1 to answer the following questions:

- Use excel to draw a bar chart for the combination of 10 and 100 years return period. Insert the data label at the centre of each bar (7.5 marks)
- Use excel to draw a pie chart for the combination of 10 and 100 years return period. Insert the data label at the centre of each bar (7.5 marks)
- (2.5 marks)

NOTE: for questions 1 and 2, save the Excel document in the format:  
DEPT\_EES\_15\_16\_0001.

### QUESTION THREE

- What is communication? (2.5 marks)
- State five reasons why we need to improve communication (5 marks)
- Describe communication feedback mechanism with the aid of a diagram (5 marks)
- Use a chart to show four skills required for communication with percentages inclusive (5 marks)

## SECTION TWO

### QUESTION FOUR

List eight forms of communication and use a flow chart to describe the purpose of communication  
(17.5 marks)

### QUESTION FIVE

The SIWES program has been included in the engineering curriculum to enhance industry experience of students before completing their first degree; develop a Microsoft document for a title page, dedication, acknowledgment and chapters one to two of your sample SIWES report. Save the file with this name: SIWES\_EES\_15\_16\_0001  
(17.5 marks)

### QUESTION SIX

Write short note on the following terms:

- a. The Layman (5.5 marks)
- b. The Executive (4 marks)
- c. The Expert (4 marks)
- d. The Technician (4 marks)

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**DEPARTMENT OF MECHANICAL ENGINEERING**  
*HARMATTAN SEMESTER EXAMINATION (2020/2021 Session)*

**COURSE:** MEG 411: REFRIGERATION AND AIR CONDITIONING I

**INSTRUCTION:** Answer any four questions

**UNITS:** 2

**TIME ALLOWED:** 2 hours

**DATE:** Aug. 25th, 2021

**Questions**

- 1 (a) Briefly describe the **operation** of a refrigeration system operating with a **named refrigerant** taking into consideration the **four basic components**. (8 marks)  
(b) List **four** advantages of absorption refrigeration system over vapour compression refrigeration system. (8 marks)  
(c) A deep freezer operates between the temperature limits  $-20^{\circ}\text{C}$  and  $35^{\circ}\text{C}$  and has the refrigerating capacity of 0.8 ton with R12 refrigerant. Calculate the compressor work assuming isentropic compression and refrigerant inlet to the compressor being dry saturated vapour. (9 marks)
- 2 (a) List and briefly discuss **eight** factors important in the selection of a refrigerant. (12 marks)  
(b) In a vapour absorption refrigerant system, the heating, cooling and refrigeration temperatures are  $115^{\circ}\text{C}$ ,  $30^{\circ}\text{C}$ , and  $-10^{\circ}\text{C}$ , respectively. Find the COP of the system. Also, in case the heating temperature is increased to  $200^{\circ}\text{C}$  and the refrigeration temperature is reduced to  $-33^{\circ}\text{C}$  with cooling temperature remaining the same, find the new COP and change in COP. (13 marks)
- 3 (a) What is the difference between **primary** and **secondary** refrigerants? Give **two** examples of each refrigerant. (8 marks)  
(b) A compressor manufacturing company manufactures one model of compressor used for air conditioning applications in a tropical environment. The compressor was tested in a refrigerating calorimeter keeping the evaporator temperature of  $8^{\circ}\text{C}$  and condensing temperature of  $35^{\circ}\text{C}$  using R22 refrigerant and it was found that the compressor produced a refrigerating effect of 5 TR. With dry saturated refrigerant before compression, determine the following:  
(i) The mass flow rate of the refrigerant.  
(ii) Volume flow rate handled by the compressor.  
(iii) Power required by the compressor.  
(iv) Heat rejected in the condenser.  
(v) COP of the cycle (assuming a simple vapour compression cycle). (17 marks)
- 4 (a) What do you understand by cryogenic refrigeration? State two applications of cryogenic refrigeration. (8 marks)  
(b) A refrigeration plant works between the temperature limits of  $-5^{\circ}\text{C}$  and  $25^{\circ}\text{C}$ . The refrigerant  $\text{CO}_2$  is wet at entry to the compressor and has dryness fraction of 0.6. The refrigerator has actual COP 70% of the theoretical COP. If there is no undercooling, determine the ice formed during a period of 24 hours from water at  $20^{\circ}\text{C}$ . The mass of  $\text{CO}_2$  circulated is 5 kg/min. Take enthalpy of fusion of ice as 336 kJ/kg. The properties of  $\text{CO}_2$  are as follows:

Saturation temperature ( $^{\circ}\text{C}$ )	Specific enthalpy (kJ/kg)		Specific entropy (kJ/kg-K)
	$h_f$	$h_g$	
25	81.25	202.75	0.2513
-5	-7.53	238.5	-0.04187

(17 marks)

- 5 (a) List any **five** physical properties and **six** chemical properties related to a refrigerant. (11 marks)

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(b) Twenty-eight tonnes of ice at  $0^{\circ}\text{C}$  is produced per day in an ammonia refrigeration plant. The temperature range in the compressor is from  $25^{\circ}\text{C}$  to  $-15^{\circ}\text{C}$ . The refrigerant is dry and saturated at the end of compression. If the actual COP is 60% of the theoretical COP, calculate the power supplied or required to drive the compressor. Assume latent heat of ice =  $335\text{ kJ/kg}$ . Use the properties of refrigerant given below:

Temperature ( $^{\circ}\text{C}$ )	$h_f$ ( $\text{kJ/kg}$ )	$h_g$ ( $\text{kJ/kg}$ )	Entropy ( $\text{kJ/kg-K}$ )	
			$s_f$	$s_g$
+25	+100.04	1319.22	+0.3473	4.4852
-15	-54.56	1304.99	-2.1338	5.0585

(14 marks)

6 (a) Moist air, saturated at  $10^{\circ}\text{C}$ , flows over a heating coil at the rate of  $5000\text{ m}^3/\text{h}$ . Air leaves the coil at  $40^{\circ}\text{C}$ . Plot the process on a psychrometric chart and determine the following:

(i) WBT of air, (ii) the sensible heat transfer in kW, and (iii) the total heat transferred in kW.

(12 marks)

(b) Moist air having DBT and BT of  $40^{\circ}\text{C}$  and  $20^{\circ}\text{C}$ , respectively, flows over a cooling coil at the rate of  $7000\text{ m}^3/\text{h}$ . Finally, it is cooled to  $26^{\circ}\text{C}$  DBT. Plot the process on psychrometric chart and determine: (i) Final BT of air, (ii) the total heat transferred in kW. If the cooling coil surface temperature is  $22^{\circ}\text{C}$ , find the bypass factor of the coil. (13 marks)

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DEPARTMENT OF MECHANICAL ENGINEERING  
HARMATTAN SEMESTER EXAMINATION (2020/2021 Session)

COURSE: MEG 401: MACHINE DESIGN II  
INSTRUCTION: Attempt any four (4) questions  
TIME ALLOWED: 2 hours

Course Units: 3

DATE: Aug 30<sup>th</sup>, 2021

**Question 1**

- (a) (i) What are Limits and Fits? (ii) Define the following with respects to limits and fits. (a) Basic size, (b) Deviation, (c) Tolerance, (d) Fundamental Deviation (iii) Limits and fits can be done on two (2) basis, list and briefly explain  
(b) Find the shaft and hole dimensions for a loose running fit with a 34-mm basic size.

**Question 2**

- (a) (i) What are gears? (ii) What are the advantages and disadvantages of gear drives? (iii) Label the Figure below showing a part of a gear

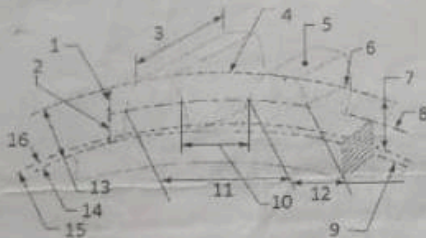


Figure 1



Figure 2

- (b) A gear set consists of a 16-tooth pinion driving a 40-tooth gear. The diametral pitch is 2, and the addendum and dedendum are  $1/P$  and  $1.25/P$ , respectively. The gears are cut using a pressure angle of  $20^\circ$ . (i) Compute the circular pitch, the centre distance, and the radii of the base circles. (ii) In mounting these gears, the centre distance was incorrectly made 14 in larger. Compute the new values of the pressure angle and the pitch-circle diameters.

**Question 3**

- (a) A power screw is 23 mm in diameter and has a thread pitch of 7 mm. (i) Find the thread depth, the thread width, the mean and root diameters, and the lead, provided square threads are used.  
(ii) Repeat part (a) for Acme threads. (b) A bar 3 m long is made of two bars, one of copper having  $E = 105 \text{ GN/m}^2$  and the other of steel having  $E = 210 \text{ GN/m}^2$ . Each bar is 25 mm broad and 12.5 mm thick. This compound bar is stretched by a load of 50 kN. Find the increase in length of the compound bar and the stress produced in the steel and copper. The length of copper as well as of steel bar is 3 m each.

- (b) A single-threaded 20 mm power screw is 20 mm in diameter with a pitch of 5 mm. A vertical load on the screw reaches a maximum of 3 kN. The coefficients of friction are 0.06 for the collar and 0.09 for the threads. The frictional diameter of the collar is 45 mm. Find the overall efficiency and the torque to "raise" and "lower" the load.

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**Question 4**

- (a) (i) Draw the four types of threaded fastener: (1) Screw (2) Bolt and nut; (3) Stud and nut, (4) Threaded rod and nuts. (ii) What are Power Screws? List 5 applications of Power Screws  
(b) A bracket, as shown in Figure 3, supports a load of 30 kN. Determine the size of bolts, if the maximum allowable tensile stress in the bolt material is 60 MPa. The distances are:  $L_1 = 80 \text{ mm}$ ,  $L_2 = 250 \text{ mm}$ , and  $L = 500 \text{ mm}$ .

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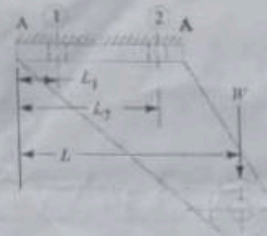
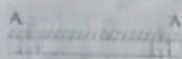


Figure 3

## Question 5

A square-thread power screw has a major diameter of 32 mm and a pitch of 4 mm with double threads, and it is to be used in an application similar to that in Figure 2. The given data include  $f = f_c = 0.08$ ,  $d_c = 40$  mm, and  $F = 6.4$  kN per screw.

- Find the thread depth, thread width, pitch diameter, minor diameter, and lead.
- Find the torque required to raise and lower the load.
- Find the efficiency during lifting the load.
- Find the body stresses, torsional and compressive.
- Find the bearing stress.
- Find the thread bending stress at the root of the thread.
- Determine the von Mises stress at the root of the thread.
- Determine the maximum shear stress at the root of the thread.

## Question 6

- (i) What are the advantages and disadvantages of welded joints over riveted joints? (ii) With the aid of diagrams briefly discuss the types of welded joints.
- A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 kN. Find the length of weld if the permissible shear stress in the weld does not exceed 55 MPa.



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*HARMATTAN SEMESTER EXAMINATION (2020/2021 Session)*

**COURSE:** MEG 409: Mechanics of Metal Forming

**INSTRUCTION:** Attempt any four questions

**TIME ALLOWED:** 2 hours

**DATE:** Aug 26<sup>th</sup>, 2021

**Question One**

- (a). Describe the process of Metal forming processes (7 marks)
- (b). What is Cold and Hot working as it relates to shaping operation (10 marks)
- (c). Enumerate three (3) factors upon which recrystallization temperature is premised (3 marks).

**Question Two**

- (a). Enumerate five (5) advantages and disadvantages of (i). cold and (ii). hot working processes (10 marks)
- (b). What is forging (4 marks)
- (c). Describe open die forging with the aid of a simple diagram. (6 marks)

**Question Three**

- (a). Describe the itemized with the aid of diagram(s) if any
  - (i). Closed die forging (ii). Cogging (iii). Drop forging (10marks)
- (b). Enumerate five (5) forging defects (5 marks)
- (c). what is parting plane in forging design (5 marks)

**Question Four**

- (a). Describe with the aid of diagram rolling process and operation (10 marks)
- (b). Define the following rolled products
  - (i). Blooms (ii). Billet (iii). Slab (iv). Plate (v). Sheet (5 marks)
- (c). Enumerate four (4) defects in rolling (5 marks)

**Question Five**

- (a). Describe the following with the aid of diagram
  - (i). Two high mill (ii) Three high mill (iii). Four high mill (12 marks)
- (b). Compare and contrast in a tabular form; Hot extrusion and Cold extrusion (8 marks)

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**Question Six**

- (a). What are extrusion defects (5 marks)
- (b). Enumerate five (5) advantages of extrusion process (5 marks)
- (c). Compare and contrast in a tabular form; Forward and Backward extrusion process. (10 marks)





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**DEPARTMENT OF MECHANICAL ENGINEERING**  
HARMATTAN SEMESTER EXAMINATION (2020/2021 Session)

**COURSE:** MEG 403: Vibration

**Course Units:** 3

**INSTRUCTION:** Attempt any four (4) questions

**TIME ALLOWED:** 2 hours

**DATE:** Aug 26<sup>th</sup>, 2021

**Question 1**

(a) What do you understand by the following terms in Vibration analysis?

- (i) Damping
- (ii) Phase Angle
- (iii) Degree of Freedom
- (iv) Resonance

[10 Marks]

(b) A 1.5 kg block is suspended by a spring having a stiffness of 800N/m. The block is pulled 35mm down from its equilibrium position and released with zero initial velocity. Determine the static deflection of the spring, the natural frequency of the system and an expression for the displacement of the system. [15 Marks]

**Question 2**

(a) Determine the equivalent spring constant of the system shown in Figure 1 below.

[10 Marks]

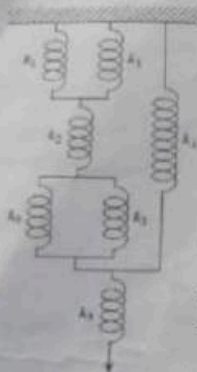


Figure 1

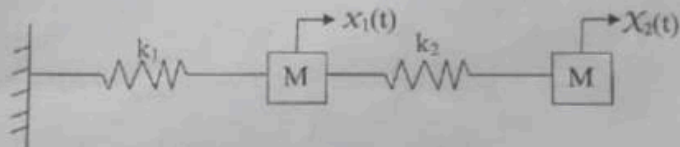


Figure 2

(b) If  $k_1 = k_2 = k_3 = k_4 = k_5 = 510 \text{ N/m}$ , and a mass of 10 kg is hung on the system, determine the displacement, velocity and acceleration at time  $t = 10 \text{ s}$  if the system is given an initial displacement of 35 mm. [15 Marks]

**Question 3**

(a) Determine the Characteristic equation, Eigen values and Eigen Vectors of the 2-DOF of the spring-mass system as shown below. Given that  $\{K_1=K_2=40\text{N/m and } M_1=15\text{kg, } M_2=20\text{kg}\}$  [25 Marks]

**Question 4**

A vibrating System of mass 500kg is analysed as being supported by two springs of stiffness of  $k_1=30\text{kN/m}$  and  $k_2=50\text{kN/m}$ . The system is constrained to move only in the vertical direction by frictionless guides. While at the equilibrium position, the body is suddenly struck by an impulse of 300Ns which acts vertically downward. Determine the period of the vibration, the maximum displacement, the maximum acceleration and the maximum velocity for the vibrating system if

(i) the springs are arranged in parallel (ii) the springs are arranged in series.

[25 Marks]

**Question 5**

A body of mass 100kg supported by two identical springs, each of stiffness 1.25 kN/m, and a viscous damper. The body is constrained to move vertically along the frictionless guides in Figure 3 below. The body is given a small displacement and released. The amplitude of vibration of the body is observed to decrease by 50% of

the initial value after 8 consecutive cycles of oscillation. (i) Determine the damping coefficient of the damper. (b) Obtain the value of the critical damping coefficient of the damper. (c) Determine the Logarithmic Decrement  $\delta$ . (d) Determine an expression for the vibration of the system. [25 Marks]

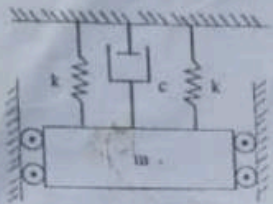


Figure 3

**Question 6**

(a) An industrial machine of mass 453.4 kg is supported on springs with a static deflection of 0.508 cm. If the machine has a rotating unbalance of 0.2303 kg.m, determine (i) the force transmitted to the floor at 1200 rpm and (ii) the dynamic amplitude at this speed. (Assume damping to be negligible.) [13 Marks]

(b) If the machine of Problem 6(a) is mounted on a large concrete block of mass 1136 kg and the stiffness of the springs or pads under the block is increased so that the statical deflection is still 0.508 cm, what will be the dynamic amplitude? [12 Marks]

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HARMATTAN SEMESTER EXAMINATION (2019/2020 Session)

COURSE: MEG 413: AUTOMATIC CONTROL SYSTEM

INSTRUCTION: Attempt Question one (1) and any other two (2) questions

TIME ALLOWED: 2 hours

DATE: August 23th, 2021

### SECTION A

- 1.
- (a). Describe the term Automatic Control System 3 marks
- (b). (i) State two major classification of control system and represent them using a schematic diagram 2 marks
- (ii) Describe the term multivariable control system and use the schematic diagram to express and explain its terms. 7 marks
- (c). (i) State 3 advantages of a control system
- (ii) Mention two advantages and disadvantages of Close loop system
- (iii) Mention two advantages and disadvantages of Open loop system 8 marks

### SECTION B

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- 2.
- (a). (i) Mention steps (6) of a control system design 5 marks
- (ii) Describe the term time response and mention two classifications of this term. 5 marks
- b. Define the following: (i). transfer function (ii). Laplace transform (iii). Transient response (iv). Force response 5 marks
- (c). Consider a closed loop system shown in figure 2.1. If  $H(s)$  is the feedback in the  $s$  domain,  $C(s)$  is the response in  $s$  domain and  $R(s)$  is the input in the  $s$  domain, What is
- (i) transfer function in  $s$  domain  $TF(s)$
- (ii) Response in time domain  $C(t)$ . 5 marks

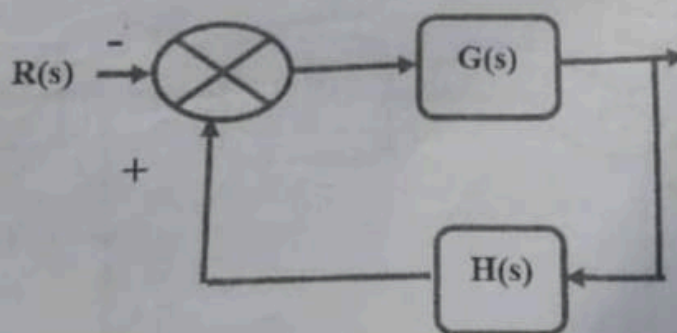


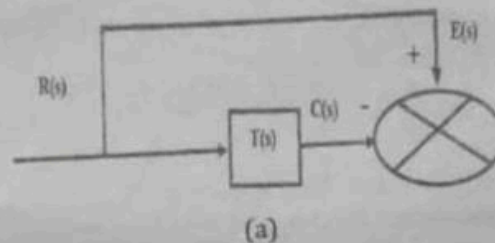
Figure 2.1

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- 3.
- Give a schematic representation for Transfer function of; (i). Transmitter (ii). Controller  
5 marks
  - Show the expressions for each of these transfer functions  
5 marks
  - Given the time step response of a control system in equation one (1) below. Identify (i). the steady state response (ii). The Time response  
10 marks

$$10 + 5e^{-t} \quad \dots \text{Equation (1)}$$

- 4.
- Show that Steady state error  $e(\infty) = \lim_{s \rightarrow 0} sR(s)[1 - T(s)]$   
10 marks
  - Find the steady state error for the system in the figure (a) below if  $T(s) = 5/(s^2 + 7s + 10)$  and the input is unit step  
10 marks



5. The time response of a first ( $1^{st}$ ) order system is represented in figure 5.1. If the system is actuated and made to operate under a control system. Calculate
- The response in time  $C(t)$  domain of the control loop  
5 marks
  - The unit step response of first order  
5 marks
  - The unit ramp step response of first order  
5 marks
  - The unit impulse step response of first order  
5 marks

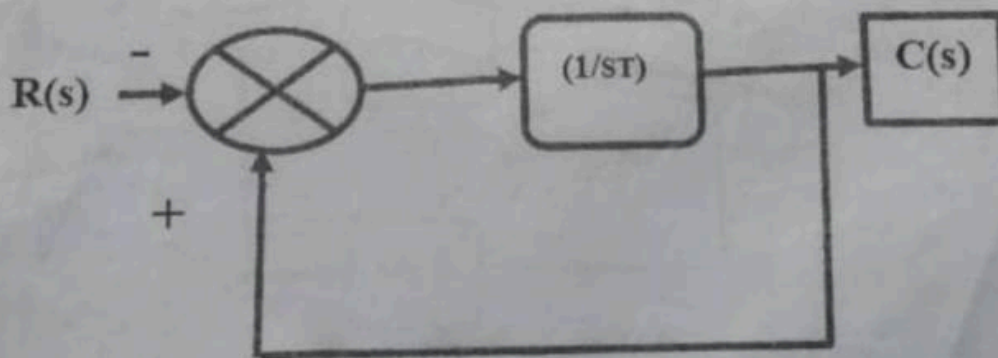


Figure 1.1



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#### QUESTION ONE (25 MARKS)

Rehoboth Nigeria limited, an owner-managed company, has developed a new type of heating using solar power, and has financed the development stages from its own resources. Market research indicates the possibility of a large volume of demand and a significant amount of additional capital will be needed to finance production. Advise Rehoboth Nigeria Limited on:

- The advantages and disadvantages of loan or equity capital (10 marks)
- The various types of capital likely to be available and the sources from which they might be obtained (9 marks)
- The method(s) of finance likely to be most satisfactory to both Rehoboth Nigeria Limited and the fund provider (6 marks)

#### QUESTION TWO (25 MARKS)

- Explain briefly the ten (10) key talents of a successful entrepreneur (10 marks)
- Explain briefly what a small-scale enterprise is (10 marks)
- How can you differentiate a small-scale enterprise from a medium and large-scale enterprise? (5 marks)

#### QUESTION THREE (25 MARKS)

- Briefly describe the following:
  - Long-term financial requirements
  - Medium-term financial requirements
  - Short-term financial requirements (3 marks each to give 9 marks)
- Enumerate and briefly discuss the five (5) types of stakeholders involved in a business? (9 marks)
- What is business? Enumerate the five (5) characteristics of a good business. (7 marks)

#### QUESTION FOUR (25 MARKS)

- Briefly discuss the four (4) main objectives of business. (12 marks)
- List the factors/circumstances which drive business enterprises toward growth. (8 marks)
- List and discuss the two (2) forms of business growth. (5 marks)

#### QUESTION FIVE (25 MARKS)

- Who is an entrepreneur? (2 marks)
- What does entrepreneurial mindset entail? (2 marks)
- i. What is opportunity as far as entrepreneurship is concerned? (5 marks)  
ii. Entrepreneurship is about opportunity. Comment. (5 marks)
- What relevance does entrepreneurial studies have with the Nigerian economy (marks)
- What do entrepreneurship and Engineering have in common? (1 mark)
- What is risk analysis and of what relevance is it in entrepreneurship? (5 marks)

#### QUESTION SIX (25 MARKS)

- What are the main components of corporate strategy? (6 marks)
- What are the benefits of corporate strategy for my business? (4 marks)
- How is a corporate strategy implemented? (5 marks)
- Explain three possible classifications of corporate strategies based on internal factors (6 marks)
- Risk analysis is not a static process. Comment. (2 marks)
- Risk analysis is about calculating probabilities. Explain. (2 marks)

Don't forget to sign and stamp from your supervisor  
that your number is correct

LN/ST/OA

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