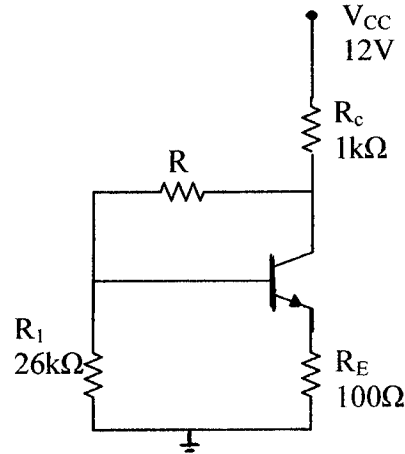


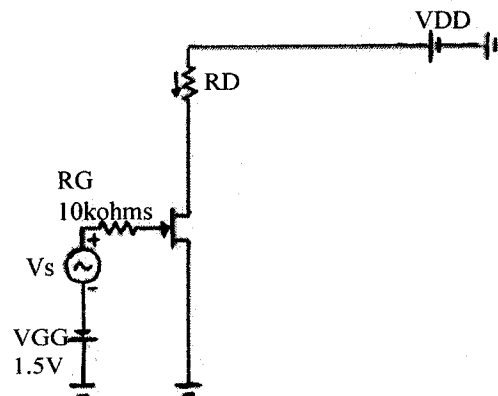
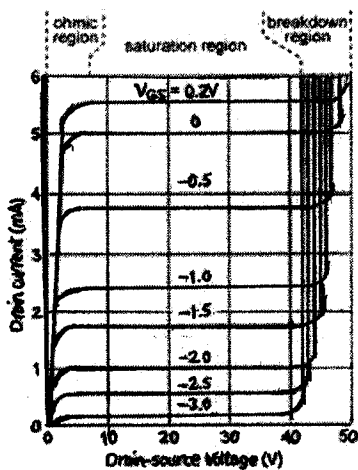
Question No. 3 (30 marks)



- Sketch the output characteristics of common emitter Bipolar Junction Transistor “BJT” showing the different modes. Also show the differences between the Field Effect Transistor “FET” and “BJT”.
- If $\alpha = 0.99$ and $V_{BE} = 0.7V$, find R in the circuit shown for an emitter current $I_E = 3mA$.



Question No. 4 (30 marks)

- What is the operational amplifier “Op-Amp” Draw its circuit and discuss its applications
- The JFET whose characteristics are given in figure is used in the circuit shown. The element values are $V_{DD}=30V$, $R_D=6K\Omega$, and $R_G= 10K\Omega$. Determine V_{DS} , I_D and V_{GS} . For the small signal model $I_{DSS}=5mA$, $V_p=3.6v$ and $\lambda=0.01v^{-1}$ find the gain.



 Helwan University	Department	Department of Mechanical Engineering			 Faculty of Eng.-Helwan
	Course Title	Numerical Methods Applications			
	Academic Level	2 nd Y. Mechatronics	Semester	1 st Semester Jan. 2016	
	Course Code	ELC 3131	Total Mark	(100)	
	Instructor(s)	Dr. Mohiy E. Bahgat and Prof. Fathy N. Hassan			
	Instructions		Time Allowed	Three Hours	

Attempt all questions assuming any missing data

Question (1)

(20 Marks)

- a) Apply the recursive algorithm to convert the following numbers as indicated in the brackets:
- i) $(191)_8 = (\text{-----})_2 = (\text{-----})_{16}$
- ii) $(D 5 E B)_{16} = (\text{-----})_{10} = (\text{-----})_2$
- b) Use the appropriate conversion algorithm (other than the recursive), to convert the following as indicated in the brackets:
- i) $(13671)_{10} = (\text{-----})_8 = (\text{-----})_2$
- ii) $(11001101001)_2 = (\text{-----})_8 = (\text{-----})_{16}$
- c) Write a MATLAB program to convert any decimal number to its equivalent binary form using the remainder approach.

Question (2)

(20 Marks)

- a) Perform the first Three iterations to find an approximate rounded root for the polynomial $x^4 + 2x^3 - 3x^2 - 6x - 42$ using the *Newton's method*.
- Note : Find the root search interval first.
- b) Write a MATLAB program to find an approximate root of the polynomial $x^5 - 2x^3 + 4x^2 - x + 1$ using the *Bisection* method approximated to the 4th decimal digit.

Question (3)

(20 Marks)

- a) Solve the following system of equations by Gaussian Elimination method. Round off all the calculations to three digits:

$$\begin{aligned} 2x_1 - 3x_2 + 2x_3 - 3x_4 &= -10 \\ 5x_1 + 2x_2 - 4x_3 + 2x_4 &= 5 \\ -3x_1 + 4x_2 + 6x_3 + 5x_4 &= 43 \\ 6x_1 - 5x_2 + 3x_3 - 4x_4 &= -11 \end{aligned}$$

- b) Explain the steps of solving a linear system of algebraic equations using the *LU* decomposition method.

Question (4)

(20 Marks)

- a) During a chemical process in a mixing reactor, the data relating time (*t*) and chemical concentration (*C*) has been collected as follows:

<i>t</i>	5	10	15	20	25	30	35	40	45
<i>C</i>	10	30	60	70	80	60	50	55	50

Estimate the rate of change for the concentration (dC/dt) at times $t = 15$ and $t = 30$ respectively using central and higher order formula. Evaluate also (d^2C/dt^2) at $t = 35$.

- b) Apply both the Trapezoidal and Simpson's Rules with ($n = 4$) to approximate the value of the integral : $\int_0^1 e^{3x^2} (1.5x^3 + x - 1.25) dx$ and then calculate the error between the results obtained by the two rules.

Question (5)

(20 Marks)



- a) Apply the *Heun's method* to solve the ordinary differential equation :

$$1.2 \frac{dy}{dx} + 2.4 y - 0.6 x^2 - 3.6 e^x = 0$$

Using a step of integration $h = 0.2$ and considering $y(0) = 1$ for $x = [0, 0.8]$.

- b) Use Runge-Kutta fourth order method with $h = \frac{\pi}{4}$ to solve the ordinary differential equation : $e^y \frac{dy}{dx} + x^2 y^2 = 2 \sin(3x)$. Consider $y(0) = 5$ among the interval $x = [0, \pi]$.

With best wishes

	Dept./Division: Production Engineering / Mechatronics Academic Level: Second Course Code and title: GEN 7217/ Marketing & Management Instructor: Dr. Ahlam Abo-Shady /A. Abd El-Moaty Total Mark: 40 Mark	Semester: First 2015/2016 Time Allowed: 2 hours	

- Write short notes on the following:
 - Types of production and the requirements of each.
 - Different types of business organizations.
 - The production-management cycle, and simplified production system.
 - The advantages and disadvantages of:
 - The line organization.
 - The functional organization

[10 Marks]
- An accounting firm generated services valid at L.E. 8,000 per day and has total cost of L.E. 5,000 per day. What is a measure of its productivity?

[5 Marks]
- The annual gross revenue 'R' from the manufacture of a certain product is \$700,000, the manufacturing costs are 60% of the annual gross revenue and the fixed cost per year is \$160,000.
 Plot with a suitable scale the break even graph, and determine the annual profit.

[5 Marks]


- A small company produces 4 products. An order is received to deliver 1,000 units of the four products, given the following data:

Product	Batch size	Setup time per (hrs)			Operation time (mins)			Non operation time (hrs/batch/m/c)
		M/c 1	M/c 2	M/c 3	M/c 1	M/c 2	M/c 3	
1	100	1	0.2	0.5	5	2	4	1
2	200	0.2	---	1	4	---	8	2
3	500	0.5	1	---	4	2	---	3
4	200	1	1	1	4	5	10	1

Determine

- The plant utilization
 - The number of days required to deliver the order if the plant works 5 days a week, and 8 hours a day
- [10 Marks]**
- What are the steps in market research?
 - What is the modern definition of marketing? And what is the utility that marketing provide?
 - Discuss the product life cycle(use drawing to explain your answer)
 - How is target market defined?
 - What are the main approaches to marketing?
 - What is the marketing concept?

[10 Marks]

 Helwan University	Course Title	MODELING AND SYSTEMS DEFINITIONS		
	Academic Level	B.Sc.	Semester	Second 2015/2016
	Course Code	POW7212	Total Mark	100
	Instructor(s)	Asoc. Prof Dr. said elmasry Asoc. Prof Dr. M. M. Ismail		
	Instructions	-	Time Allowed	3



Question No. (1) [15 Marks]

For the closed loop system shown in figure 1, find the transfer function using block reduction method.

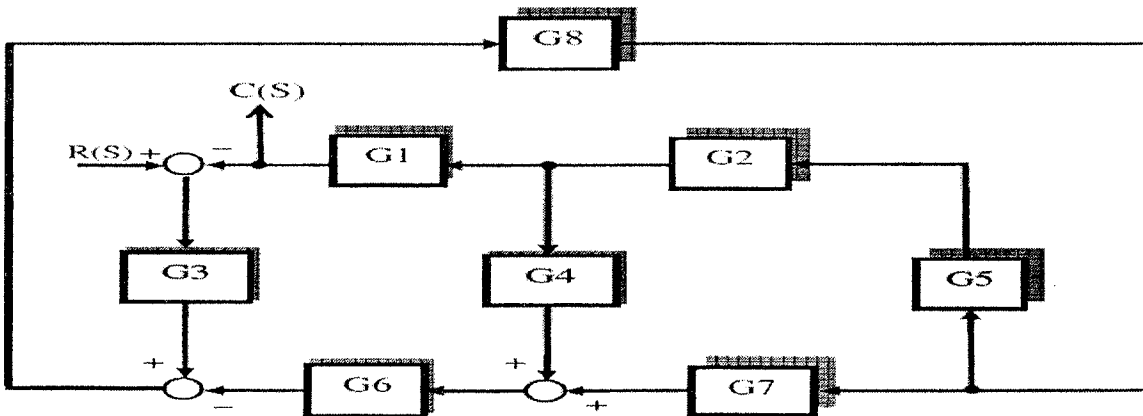


Fig 1

Question No. (2) [25 Marks]

Find the transfer functions for the two circuits shown in figures 2 and 3.

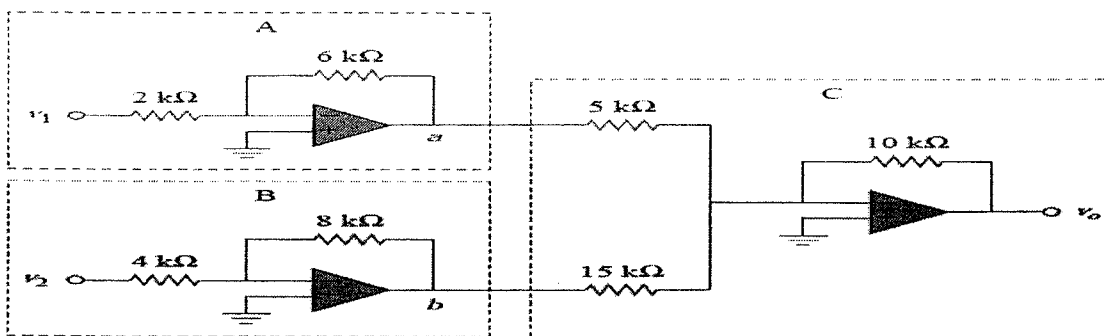


Fig 2

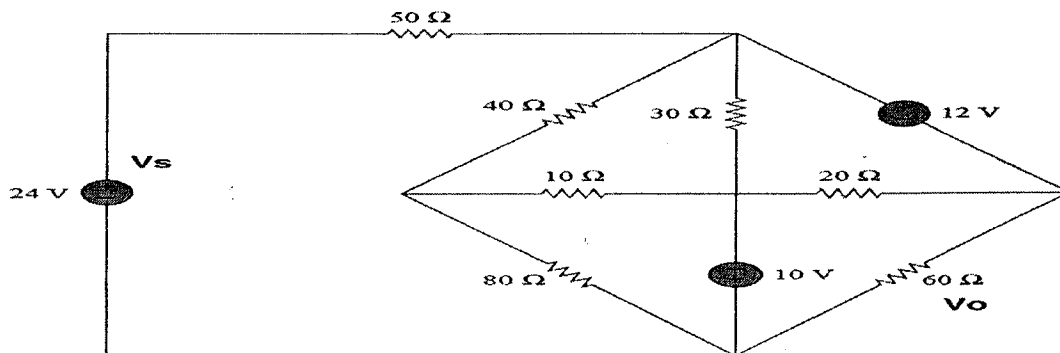


Fig 3

Handwritten notes:
 10/1/21
 ...

Question No. (3)

[10 Marks]

For the system shown in figure 4, find the transfer function $X_3(S)/F(S)$

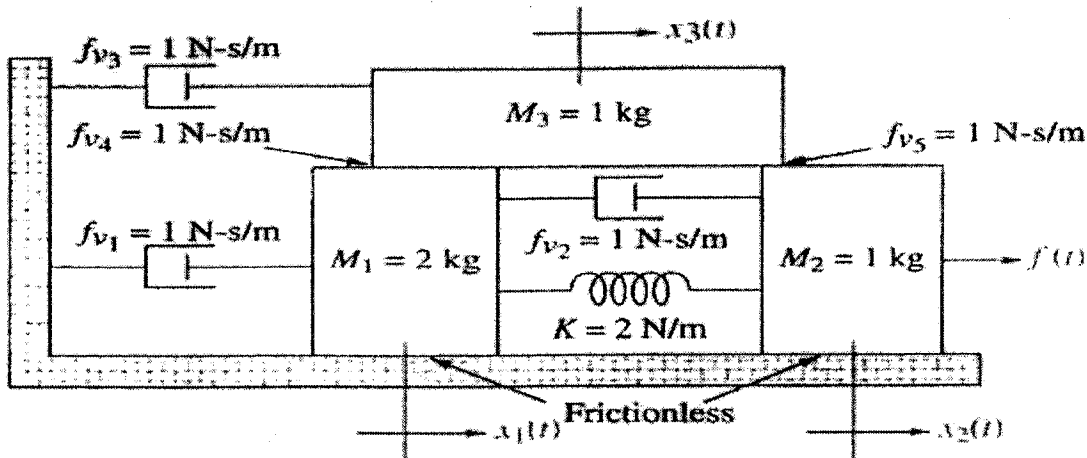
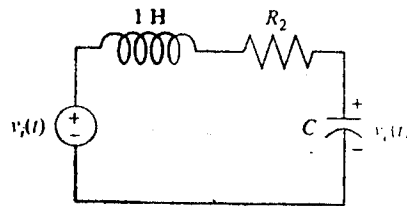


Fig4

Question No. (4)

[25 Marks]

For the circuit shown, find the values of R_2 and C to yield 12 % overshoot with a settling time of 2 ms for the voltage across the capacitor, with $v_i(t)$ as a unit step.



Question No. (5)

[25 Marks]

For the system shown, (a) find the damping D , to yield a 20 % overshoot in output angular displacement for a unit step input torque. (b) Find $\theta_1(t)$.

