أساسيات الهندسة الإلكترونية

Ministry of Higher Education		
Manzala Higher Institute for Engineering and Technology		
First semester : 2021/2022		Date: 16/1/2022
Final Exam		Level: 1
Department: Electronic Engineering		Time allowed: 3 hrs.
Total Marks: 90		Code: COM113
Course title: Fundamentals of Electronic Engineering		Examiner: Dr. Mohamed Abdel Rahman

Answer the Following Questions:

Question (1): (Total marks: 20)

a) Aided with the configurations, sketch a center-tapped transformer circuit for a full wave rectifier and demonstrate the output voltage in case of with and without capacitor filter. (10 marks)

b) A 15V - 0 -15V (rms), 50 IIz, an ideal center-tapped transformer, is used with FWR circuit with diodes having voltage drop 1 V, capacitor $C = 10000\ \mu F$ is applied as a filter capacitor across the load resistance $R_L = 100\,\Omega$, Determine the following: (10 marks)

i) DC load current I_{DC}. ii) DC load voltage E_{DC}. iii) Ripple factor γ.

Question (2): (Total marks: 25)

a) Draw the equivalent circuit of the practical model for the photovoltaic solar cell using a single diode model and define its parameters in detail. Also write down the equations describing this model. (9 marks)

b) Consider a zener diode regulator circuit as shown in Fig. 1. $V_{SS} = 24$ V, $R = 1.2\,\text{k}\Omega$, $R_L = 6\,\text{k}\Omega$ and $V_z = 10$ V. Compute the following: (10 marks)

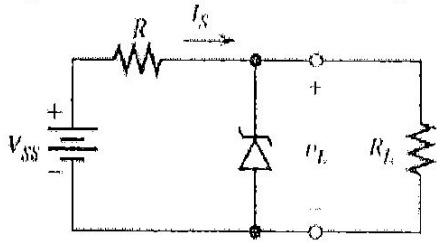

Fig.1

i) The current flowing through the load, I_L .....

ii) The source current, I_S.....

ii) The zener current I_Z at full load.....

iii) Power of zener diode P_Z.....

iv) Power supplied by the source, P_S. .....

v) Output voltage with removing the zener diode .....

c) Compare the parameters of following two diodes. (6 marks)

No.	Parameters	Light emitting diode (LED)	Photo diode
1	function		
2	Schematic symbol		
3	Bias for normal operation		
4	Applications (at least two)		

Question (3): (Total marks: 20)

a) For the common emitter BJT amplifier circuit shown in Fig.2, calculate I_B, I_C, V_{CE}, V_B, V_C and V_{CB}. Also draw its ac equivalent circuit. (11 marks)

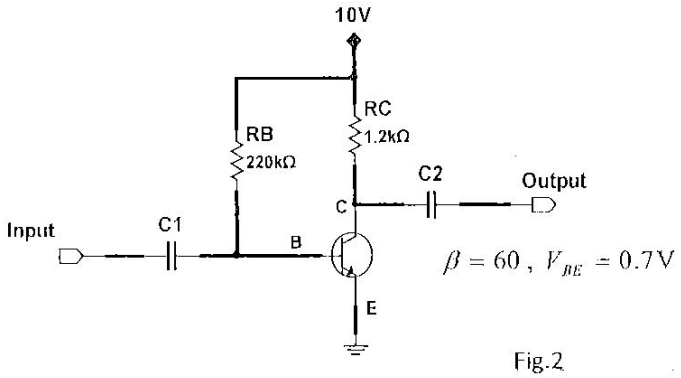

Fig.2

b) Compare the following parameters for the BJT and JFET devices. (9 marks)

No.	Parameters	BJT	JFET
1	Control element		
2	Device type		
3	Types of carriers		
4	Input resistance		
5	Thermal noise		
6	Schematic symbol		

Question (4): (Total marks: 25)

a) Aided with the configurations, draw the structure of both JFET and MOSFET devices. Also discuss and explain the physical operation for each one of them. (5 marks)

b) Draw and explain one of the applications for the silicon-controlled rectifier (SCR).
(5 marks)

c) A JFET shown in Fig. 3 has values of VGS (off) = – 8V and IDSS = 16 mA. Determine the values of VGS, ID and VDS.
(5 marks)

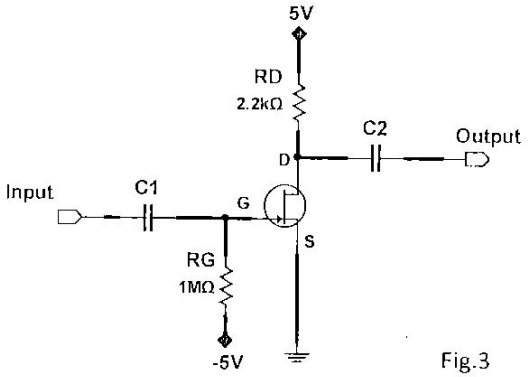

Fig.3

d) Draw the output ($I_D - V_{DS}$) and transfer ($I_D - V_{GS}$) characteristics of the n-channel JFET and illustrate the different regions of operation. (5 marks)

e) Tabulate the following parameters for the JFET and MOSFET devices. (5 marks)

No.	Parameters	JFET	MOSFET
1	Abbreviation represents....		
2	Modes of operations		
3	Thermal noise		
4	Susceptible to damage		
5	Input impedance		
6	Schematic symbol		

With my best wishes.