TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering and Technology

DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING

DME 215 Y2S1

EHL 2201

MEDICAL ELECTRONICS II

SPECIAL SUPPLEMENTARY EXAMINATIONS

SERIES: SEPT. 2017

TIME: 2 HOURS

INSTRUCTIONS TO THE CANDIDATE:

1. You should have the following for this examination:
   - Answer Booklet
   - Scientific Calculator
   - Drawing Instrument
2. This paper consists of **FIVE** questions. Answer Question **ONE (COMPULSORY)** and any other **TWO** Questions.
3. Do not write on the question paper.
4. This paper consists of **THREE** printed pages.

QUESTION ONE

(a) (i) State **THREE** characteristics of small signal amplifiers

(ii) Describe with the help of a diagram the operation of NPN common emitter amplifier (10 marks)

(b) (i) State **TWO** ways of classifying power amplifiers

(ii) Explain the differences between class A, B and C power amplifiers using simple waveforms (8 marks)

(c) (i) State **THREE** characteristics of an ideal opamp
(ii) Draw a non inverting opamp circuit and derive an expression of its output voltage gain
(iii) Give **THREE** applications of opamps (12 Marks)

QUESTION TWO

(a) (i) The output characteristics of a silicon NPN transistor connected to a supply voltage of 6V and load resistor of 1.5 KΩ are given below.

VCE				Collector current (mA)	
	I_B=0	I_B=20μA	I_B =40μA	I_B =60μA	I_B=80μA
1	0.2	1.15	1.9	2.8	3.7
4	0.3	1.25	2.05	2.95	4.0
7	0.4	1.35	2.20	3.25	4.3

(I) Plot the characteristics curves and load line

(II) Determine the current gain the base current is varied from 20μA to 60 μA (10 marks)

(b) (i) Describe with the help of a suitable diagram the operation of a JFET

(ii) State any three advantages of FETs over BJTs (10 marks)

QUESTION THREE

(a) Describe with the aid of a diagram the operation of a class A Power amplifier (10 marks)

(b) (i) Show that the efficiency of a class A amplifier is approximately 25 %

(ii) State three advantages of class A power amplifier (10 marks)

QUESTION FOUR

(a) (i) Describe the following terms as applied to operational amplifiers

(I) Open loop voltage gain

(II) Common mode rejection ratio

(ii) With the aid of a diagram, derive the expression of an opamp when used as an integrator (10 marks)

(b) (i) explain the meaning of a differential amplifier

(ii) The figure shown in Fig. Q4 is a non inverting opamp

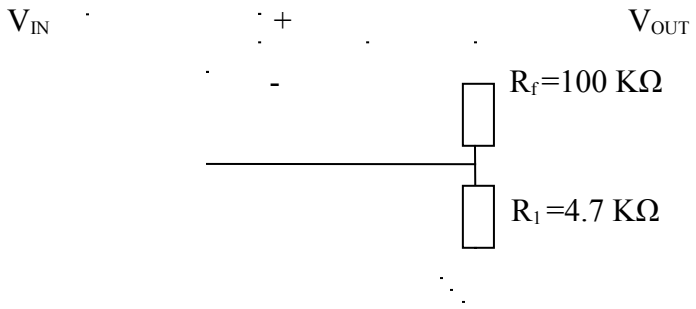


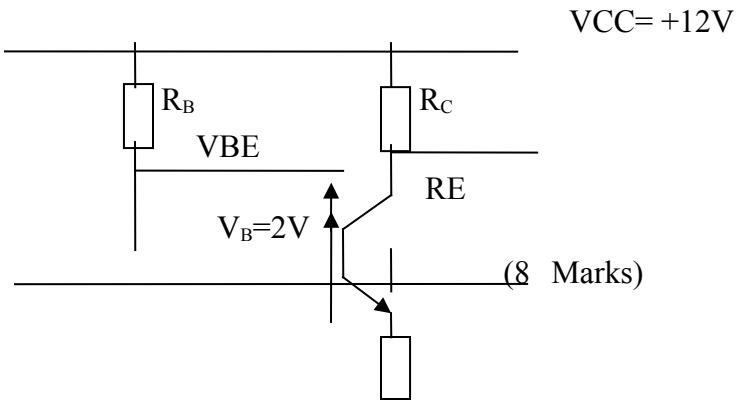
Fig. Q4

(i) Derive an expression of closed loop voltage gain

(ii) Calculate the Closed loop voltage gain of the Fig. Q4 (10 marks)

QUESTION FIVE

(a) In **FIG. Q5** calculate the values of R_B, R_E and R_C. Given hFE=100, VCE=6V, VBE=0.7, I_B=20μA and V_B=2V.



(8 Marks)

(b) (i) With a help of a diagram describe the principle of operation of Colpits oscillator, giving an expression of oscillation

(ii) State two applications of oscillators in Medical Equipment (12 marks)