NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF INDUSTRIAL TECHNOLOGY

BACHELOR OF ENGINEERING (HONS) DEGREE

Final Examination May 2013 **Analogue Electronics**

TEE 1211

Duration of Examination 3 Hours

Instructions to Candidates:

1. Answer any **five** questions only.
2. Each question carries equal marks.
3. Show all your steps clearly in any calculation.
4. Start the answers for each question on a fresh page.

Question 1

For the amplifier shown in diagram Fig 1 the transistor T1 has a β equal to 100 Determine the following bias working parameters:

(a) Base current I_B ,

(b) the collector current I_C

(c) the emitter current I_E

(d) the voltage across the collector to the ground V_C

(e) and the voltage across the collector –emitter V_{CE} . (20 marks)

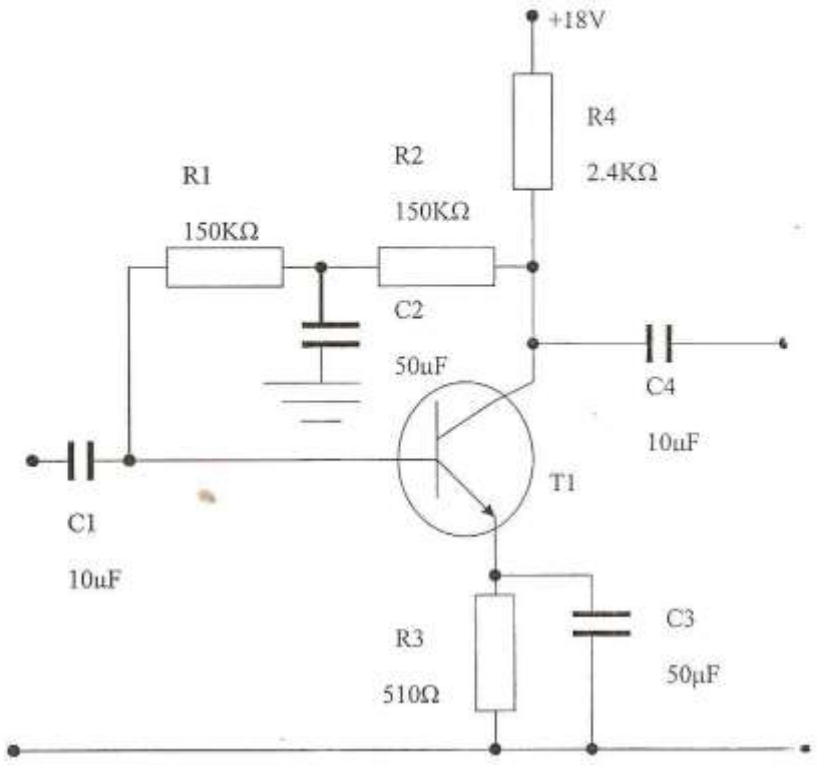

Fig 1

Question 2

(a) A shunt zener diode regulator has an input unregulated voltage of 20 volts .The zener is a 15 volts one. Calculate a suitable value of the series resistor R_S that can be used for the load current I_L that vary from 20mA to 40mA .Choose the suitable maximum power for the zener diode .Draw the circuit diagram for regulator. (10 marks)

(b) Draw the circuit of a transistor RC phase shift oscillator. Briefly describe the oscillator in terms of reason of choice components determining the output frequency. (10 marks)

Question 3

(a) Show the circuit diagram of a tripler. Give one example where this circuit is applied.

(8 marks

(b) For the circuit shown in Fig 2 ,R_{EE} equal 10KΩ h_{fe} for T1 and T2 equal 100.Calculate the values of R1 and R2 that will make the difference gain equal 500. (12 marks)

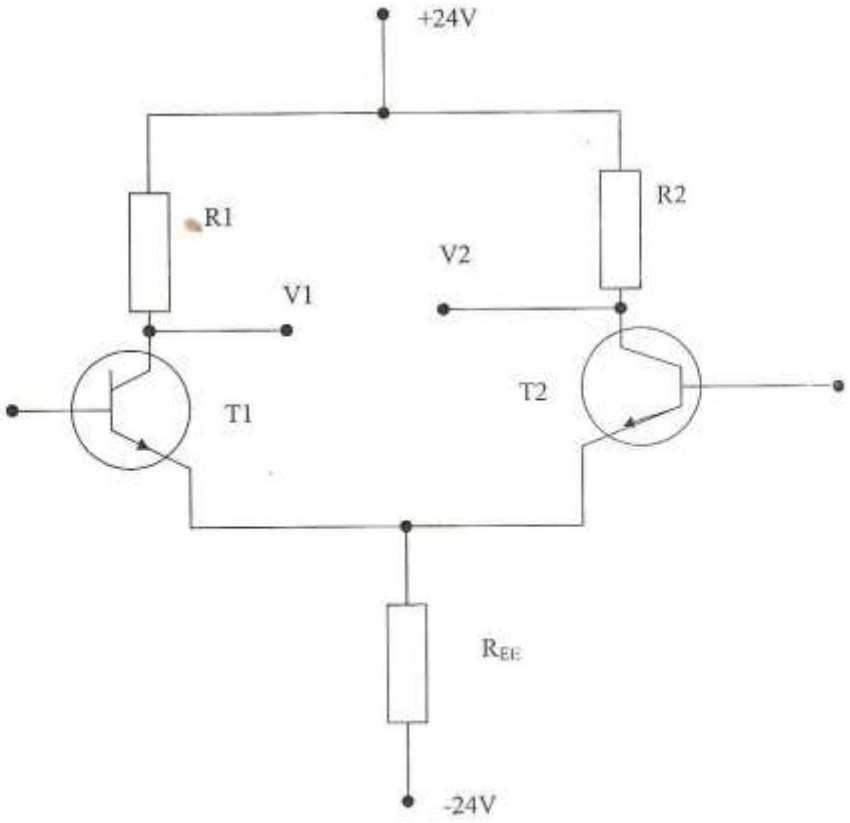

Fig 2

Question 4

(a) Find the voltage ,input impedance, and output impedance for a series negative feedback amplifier having gain of 200,feedback factor of 0,1 ,input resistance of 100KΩ and output resistance of 470KΩ. (15 marks)

(b) For the input voltage shown in Fig 3 .Determine the output if the input frequency is one kilohertz . (5marks)

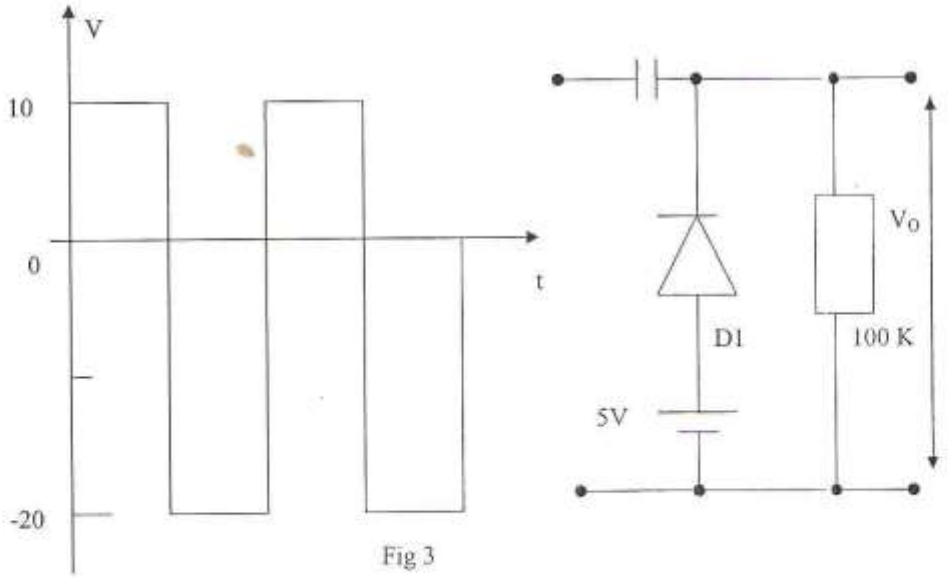

Fig 3

Question 5

For the circuit in Fig 4 h_{fe} =200, h_{ie}= 3200 and h_{oe} =20μS

(a) Draw the equivalent ac circuit of the amplifier.

(b) Calculate the input impedance Z_i

(c) Calculate the out put impedance Z_O

(d) Find the voltage gain A_V

(e) Find the current gain A_i . (20 marks)

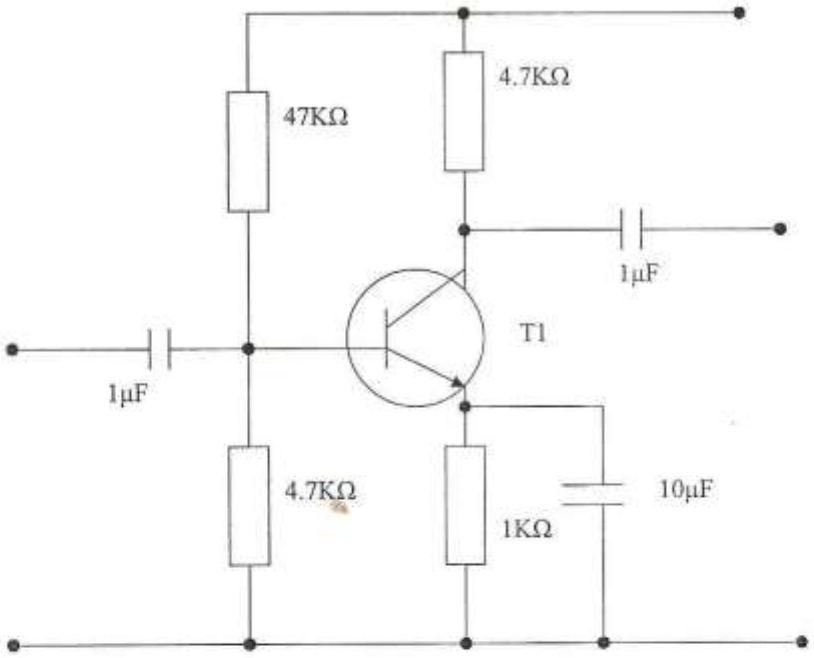

Fig 4

Question 6

(a) For the FET in Fig 5 the g_m =3.4 mS and r_d =100KΩ .Calculate the lower cut off frequency for the amplifier. (8 marks)

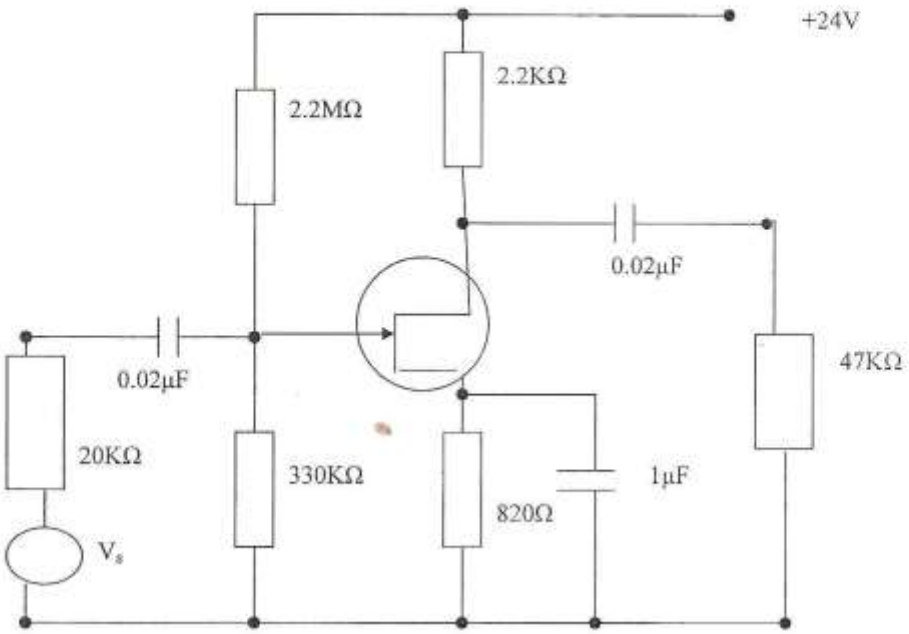

Fig 5

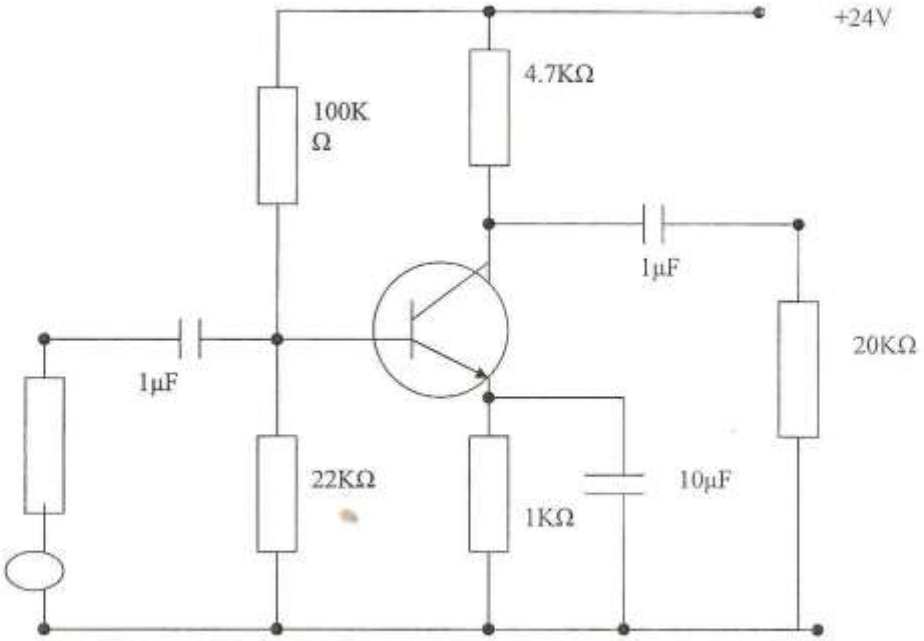

Fig 6

(b) The transistor in figure 6 has a β= 120 r_e =20Ω , r_0=100KΩ and f_T =100 MHZ.

The inter electrode capacitances are C_{be} =40pF ,C_{bc} =1.5pF and C_{ce} =5pF.

The wiring capacitances across the input is 4pF and 8pF across the output.

.Determine the upper cut off frequency . (12 marks)

Question 7

(a) Give four main features found in an IC voltage regulator . (4 marks)

(b) A 78XX three terminal voltage regulator with external transistor and current limiting is used in a power supply ,show the circuit connection of the regulator. (5 marks)

(c) What is the function of a current mirror ? Show the circuit arrangement of the current mirror . (6 marks)

(d) Give five features that are achieved when using an amplifier with negative feedback. (5 marks)

Question 8

For the two stage amplifier in Fig 7 the β of T_1 is equal to 200 and of T_2 is equal to 100,while r_{e1} of the T_1 is 12 Ω and the r_{e2} for T_2 is 10 Ω and r_{c1} is 2MΩ .

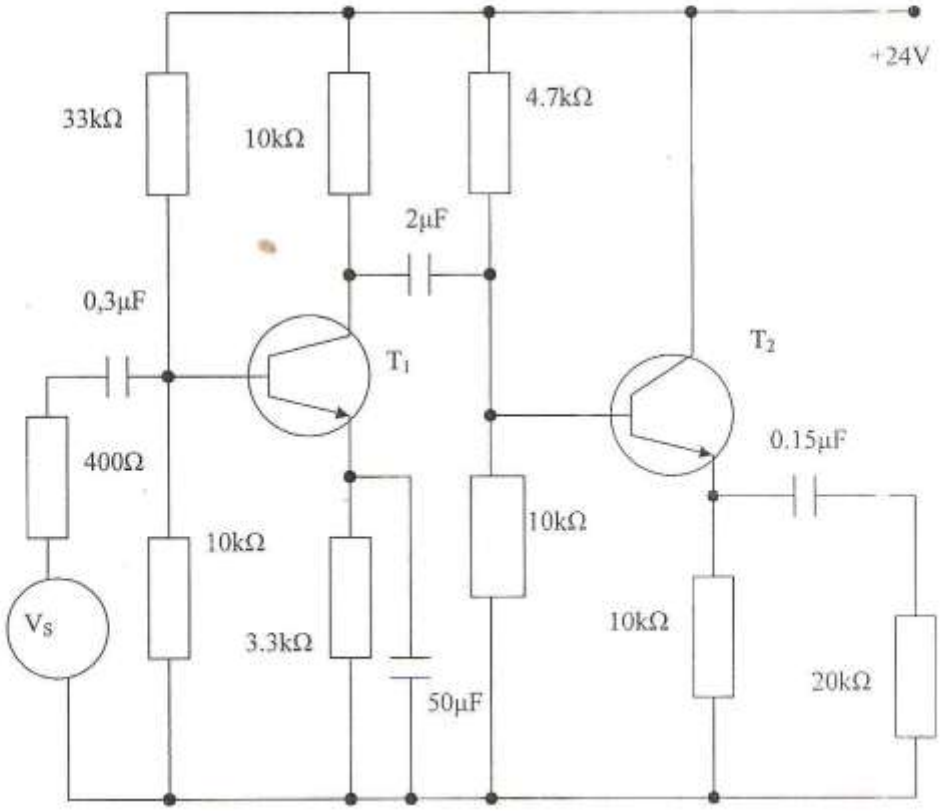

Fig 7

(a) Draw the equivalent ac circuit of the two stage amplifier .

(b) Calculate the voltage gain of the two stage amplifier.

(c) Calculate the current gain of the amplifier.

(d) Calculate the power gain of the amplifier. (20 marks)