PAPER 1

TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN ELECTRICAL AND ELECTRONIC ENGINEERING

TEE4205: ANALOGUE ELECTRONICS II

END OF SEMESTER EXAMINATION

SERIES: APRIL, 2025

TIME: 2 HOURS

DATE: APRIL, 2025

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Question ONE is Compulsory attempt any other TWO questions.

Do not write on the question paper.

Question ONE

(a) Draw the equivalent circuit of hybrid model of a common emitter configuration of an npn transistor. **(3.5 marks)**

(b) For the network of Fig.Q1 determine

(i) Z_i

(ii) Z_o

(iii) A_v

(iv) A_i **(8 marks)**

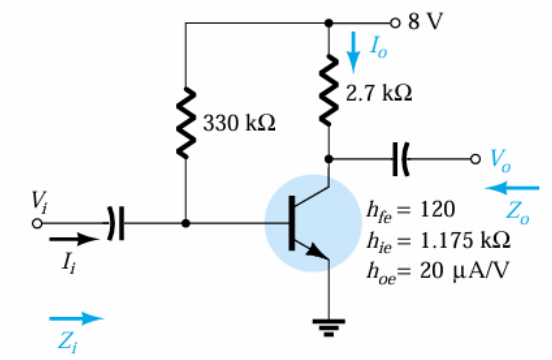

Fig.Q1

(c) Draw the r_e model of a CE configuration. **(2 marks)**

(d) Given β=120 and I_E= 3.2mA for a common-emitter configuration with $r_O = \infty$) for r_e model, determine:

(i) Z_I

(ii) A_V if a load of 2kΩ is applied

(iii) A_i with the 2kΩ load. **(8 marks)**

(e) (i) Draw a block diagram of a voltage shunt feedback system

(ii) Derive a suitable expression for the voltage gain with negative feedback. **(8.5 marks)**

QUESTION TWO

(a) Draw the a.c equivalent circuit of FET. **(2 marks)**

(b) The self-bias configuration of Fig. Q3 has an operating point defined by V_{GSQ}=-2.6Vand IDQ= 2.6 mA, with I_{DSS}= 8 mA and V_P= -6V. The network has an applied signal V_i and y_{os}= 20μS'

(i) Determine g_m

(ii) Find r_d

(iii) Find Z_i

(iv) Calculate Z_O with and without the effects of r_d

(v) Calculate A_V, with and without the effects of r_d **(12 marks)**

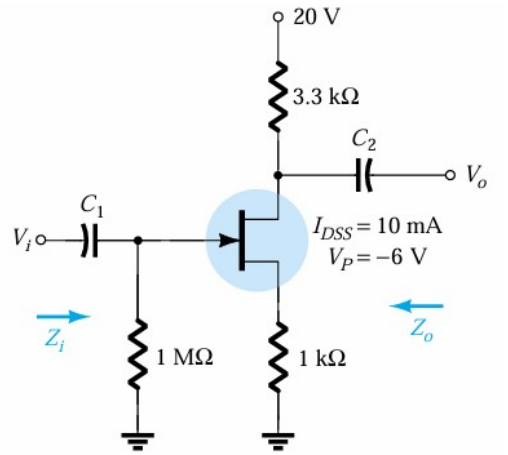

Fig.Q3

(c) Consider a triac

(i) Draw the circuit symbol

(ii) Explain the principle of operation using relevant diagrams. **(6 marks)**

QUESTION THREE

(a) Determine the voltage gain, input and output impedance with feedback for voltage series feedback having A= -100, R_i=10 kΩ, R_o=20 kΩ for feedback of :

(i) β=-0.1

(ii) β= -0.5

(iii) Comment on the values determined. **(13 marks)**

(b) State THREE advantages of negative feedback. **(3 marks)**

(c) An amplifier was designed with a 60dB gain and has an output impedance Z_o= 10 kΩ. It is required to modify its output impedance to 500Ω by applying negative feedback.

(i) Calculate the feedback factor

(ii) Determine the percentage change in the overall gain, for 10%change in the gain of the internal amplifier. **(4 marks)**

QUESTION FOUR

(a) Draw the circuit diagram of an emitter follower circuit. **(5.5 marks)**

(b) (i) State THREE reasons for the popular use of the parameters

(ii) Find the h-parameters of circuit of Fig.Q5. **(3 marks)**

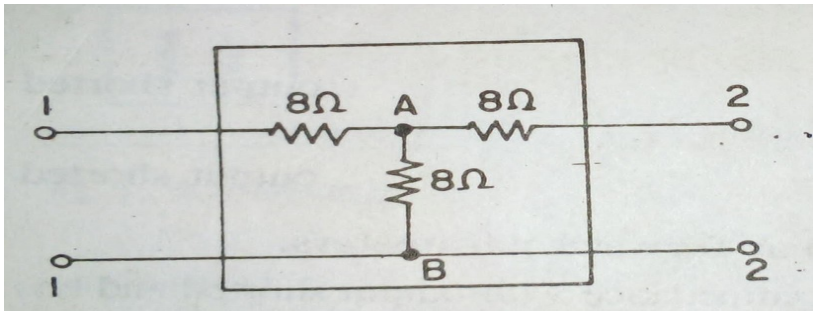

Fig.Q5. **(8.5 marks)**

(c) Discuss how equivalent circuits of a.c and d.c are drawn for a transistor amplifier. **(3 marks)**

QUESTION FIVE

(a) Explain the difference between dc and ac load line. **(2 marks)**

(b) Draw the dc and ac load line for CE circuit shown in Fig.Q4 when R_C =4kΩ, R_L=12 kΩ and V_{CC}=20V. The values of R_1 and R_2 are so as to fix the operating at 10 V, 2.5 mA. Assume R_E is negligible.

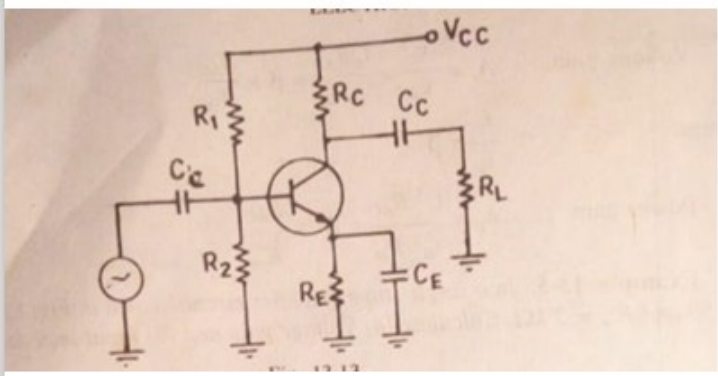

Fig.Q 4. **(10.5 marks)**

(c) In a transistor amplifier, when the signal changes by 0.01 V, the base current changes by 10 μA and collector current by 0.5 mA. If collector load R_C=2 kΩ and R_L=5 kΩ, find:

(i) Current gain

(ii) Input impedance

(iii) a.c load

(v) Power gain. **(7.5 marks)**