PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING: COMPUTER SYSTEMS* *ENGINEERING: ELECTRICAL*
SUBJECT	:	**ELECTRONICS II**
CODE	:	**EEL2211**
DATE	:	YEAR-END MAIN EXAMINATION 03 December 2016
DURATION	:	08:30 - 12:00
WEIGHT	:	40 : 60
FULL MARKS	:	100
TOTAL MARKS	:	100

EXAMINER	:	DR THOKOZANI C SHONGWE
MODERATOR	:	MR PJJ VAN ZYL 2024
NUMBER OF PAGES	:	11 PAGES, 1 ANSWER SHEET AND 1 GRAPH PAPER

INSTRUCTIONS	:	CALCULATORS ARE PERMITTED (ONLY ONE PER STUDENT)
	:	USE ONLY THE ANSWER SHEET PROVIDED WITH THIS PAPER

REQUIREMENTS	:	LINEAR GRAPH PAPER

INSTRUCTIONS TO CANDIDATES:

1. 100 MARKS = 100%
2. ATTEMPT ALL QUESTIONS.
3. THEORY TYPE QUESTIONS MUST BE ANSWERED IN POINT FORM BY CAREFULLY CONSIDERING THE MARK ALLOCATION.
4. QUESTIONS MAY BE ANSWERED IN ANY ORDER, BUT ALL PARTS OF QUESTION MUST BE KEPT TOGETHER.
5. ALL DIAGRAMS AND SKETCHES MUST BE DRAWN NEATLY AND IN PROPORTION.
6. ALL DIAGRAMS AND SKETCHES MUST BE LABELLED CLEARLY.
7. ALL WORK DONE IN PENCIL EXCEPT DIAGRAMS AND SKETCHES WILL BE CONSIDERED AS ROUGH WORK.
8. NOTE: MARKS WILL BE DEDUCTED FOR WORK WHICH IS POORLY PRESENTED.
9. NEGATIVE MARKING APPLIES IF YOUR ANSWER DOES NOT COMPLY WITH THE DETAIL REQUIRED AS REQUESTED IN CERTAIN QUESTIONS.

QUESTION 1

Answer this question on the mark-sheet provided (at the back of this paper).
Remember that there is only one correct answer for each question.

1.1 The DC power out of the load of a **half-wave** rectifier circuit is _____of the total power into the rectifier circuit.

a) 81.2 %
b) 40.6 %
c) 20.3 %
d) 10.4 %

1.2 The DC power out of the load of a **full-wave** rectifier circuit is _____of the total power into the rectifier circuit.

a) 81.2 %
b) 40.6 %
c) 20.3 %
d) 10.4 %

1.3 The Ripple factor of a **half-wave** rectifier circuit, without the smoothing capacitor is _____.

a) 202.0 %
b) 121.0 %
c) 71.3 %
d) 48.2 %

1.4 The Ripple factor of a **full-wave** rectifier circuit, without the smoothing capacitor is _____.

a) 202.0 %
b) 121.0 %
c) 71.3 %
d) 48.2 %

1.5 The input voltage, Vin = $20\pi \sin(100t)$ passes through a half-wave rectifier. What is the DC value at the output of the half-wave rectifier?

a) 5 V
b) 10 V
c) 15 V
d) 20 V

1.6 The input voltage, Vin = $32.57 \cos(100t)$ passes through a full-wave rectifier What is the RMS value of the ripple voltage at the output of the full- wave rectifier?

a) 5 V
b) 10 V
c) 15 V
d) 20 V

1.7 The half power point is also called the ____ point.

a) 1 dB
b) 2 dB
c) 3 dB
d) 4 dB

1.8 The purpose of the Zener diode in a Zener Regulator circuit is to

a) hold the circuit's output terminal voltage at a constant.
b) allow the circuit's output terminal voltage to fluctuate around V_Z.
c) let the circuit's output terminal voltage to rise from zero to V_Z.
d) to keep the circuit's output terminal voltage below V_Z.

1.9 Which of the following statements is false? The transistor series voltage regulator provides

a) a load current supply which is greater than that of a simple Zener regulator.
b) a load current supply which is less than that of a simple Zener regulator.
c) a load current supply which is $(\beta + 1)$ times greater than the maximum current which a simple Zener regulator can provide.
d) Good voltage stability

1.10 Which of the following statements is incorrect? At the half power point,

a) the power gain is either 3 dB or -3 dB.
b) the voltage gain is either 3 dB or -3 dB.
c) the votage gain is 0.707.
d) the votage gain is 1.414.

1.11 The cut off frequency of a high pass filter circuit constructed from of $R = 100\ k\Omega$ and $C = 10\ \mu F$ is

a) 1 rad/s
b) 10 rad/s
c) 100 rad/s
d) 1000 rad/s

1.12 The phase angle of an RC **high** pass filter, at the cut-off frequency is

a) 90^0
b) 45^0
c) -90^0
d) -45^0

1.13 The phase angle of an RC **low** pass filter, at the cut-off frequency is

a) 90^0
b) 45^0
c) -90^0
d) -45^0

1.14 The reciprocal (or inverse) of impedance (1/Z) is called

a) conductance
b) admittance
c) susceptance
d) resistance

1.15 Conductance is the

a) imaginary part of impedance
b) real part of impedance
c) real part of admittance
d) imaginary part of admittance

1.16 Susceptance is the

a) imaginary part of impedance
b) real part of impedance
c) real part of admittance
d) imaginary part of admittance

1.17 In the transistor small signal model, the simple h-parameter model is derived by ignoring

a) h_{fe} and h_{oe}
b) h_{re} and h_{ie}
c) h_{re} and h_{fe}
d) h_{re} and h_{oe}

1.18 The conducting angle θ_C of the Class AB amplifier is

a) $\theta_C = 360^0$
b) $\theta_C < 180^0$
c) $180^0 \leq \theta_C \leq 360^0$
d) $180^0 < \theta_C < 360^0$

1.19 Which Classes of power amplifiers are the most power efficient?

a) Class A and Class B
b) Class B and Class AB
c) Class AB and Class C
d) Class C and Class A

1.20 A rectifier is used to

a) Convert ac to pulsating dc.
b) Reduce the variations in a pulsating dc signal.
c) Maintain a constant power supply dc output voltage.
d) Convert one dc level to another.

1.21 The basic power supply is made up of

a) A regulator, a follower, and a rectifier.
b) A filter, a follower and a regulator.

c) A rectifier, a filter and a regulator.
d) A regulator, a rectifier and an oscilloscope

1.22 A voltage regulator

a) Maintains a constant power supply dc output voltage.
b) Steps up or steps down the line voltage.
c) Reduces the variations in dc voltage.
d) Both (a) and (c) above.

1.23 The most commonly used type of rectifier is the

a) Half-wave rectifier.
b) Full-wave centre-bridge tapped rectifier.
c) Bridge rectifier.
d) Centre-tapped bridge rectifier.

1.24 A capacitive filter is added to a half-wave rectifier. The initial value of capacitance is 22 μ F. If this value is increased to 100 μ F, the ripple output from the circuit will

a) Increase.
b) Decrease.
c) Remain the same.
d) Increase, decrease and remain the same.

1.25 Which of the following will reduce the ripple output from a filtered rectifier?

a) Increasing the value of the filter capacitor.
b) Increasing the load resistance.
c) Adding a Zener voltage regulator.
d) All of the above.

1.26 The term full load means

a) Load resistance is at maximum value.
b) Load resistance is at minimum value.
c) No load resistance is present.
d) Load current is at a minimum value.

1.27 What is the average voltage of the waveform $V(t) = 2 + 10\sin(10t)$?

a) 10 V
b) 0 V
c) 5 V

d) 2 V

1.28 The input voltage, Vin = 20π sin(100t) passes through a half-wave rectifier. What is the DC value at the output of the half-wave rectifier?

a) 5 V
b) 10 V
c) 15 V
d) 20 V

1.29 The input voltage, Vin = 50 cos(100t) passes through a full-wave rectifier What is the RMS value of the ripple voltage at the output of the full- wave rectifier?

a) 5.0 V
b) 10.1 V
c) 15.4 V
d) 20.0 V

1.30 The input voltage, Vin = 20π sin(100t) passes through a full-wave rectifier with load resistor R_L=10 Ω. What is the efficiency of the full-wave rectifier?

a) 10.4 %
b) 81.2 %
c) 40.6 %
d) 35.3 %

1.31 The equation that correctly defines one of the hybrid parameters is

a) $V_O = h_{11} \times I_i + h_{21} \times V_i$
b) $V_i = h_{11} \times I_i + h_{12} \times V_O$
c) $I_O = h_{12} \times V_O + h_{22} \times V_O$
d) $I_i = h_{21} \times I_O + h_{22} \times V_O$

1.32 The h_{12} hybrid parameter is defined as the

a) Open-circuit output admittance
b) Open-circuit reverse voltage ratio
c) Short-circuit forward current ratio
d) Short-circuit input impedance

1.33 The h_{22} hybrid parameter is defined as the

a) Open-circuit output admittance
b) Open-circuit reverse voltage ratio

c) Short-circuit forward current ratio
d) Short-circuit input impedance

1.34 The hybrid parameter that is presented by the name $h_{f\_}$ is

a) h_{11}
b) h_{12}
c) h_{21}
d) h_{22}

1.35 What is the purpose of the smoothing capacitor in a Full-wave or Half-wave rectifier?

a) To increase the output ripple voltage
b) To allow more current to flow in the circuit
c) To reduce the output ripple voltage
d) To keep the output voltage fixed

1.36 Crossover distortion in class B amplifiers can be eliminated by

a) Increasing the amplifier's efficiency
b) Providing negative feedback
c) Providing positive feedback
d) Providing biasing for the switching devices

1.37 A radio amplifier amplifies a signal from 5 μV to 2,5 V. The gain at the cut-off point is _____.

a) 500 000
b) - 1,012 dB
c) -3 dB
d) 110,98 dB

1.38 An amplifier normally has a power gain of 12,000. If the power gain of the circuit drops by 3 dB, the value of the new power-gain will be approximately

a) 6,000
b) 4,000
c) 9,000
d) Zero

1.39 What frequency is two decades above 5 kHz?

a) 105 kHz

b) 25 kHz
c) 500 kHz
d) Cannot be determined from the information given

[39]

QUESTION 2

The circuit below in Figure 2.1 is of a simple shunt voltage regulator using a 6V zener diode rated at 10 W. The voltage regulator is to supply load currents I_L, ranging from 0 A to 0.25 A, and the input DC supply V_S, varies from 10 V to 14 V.

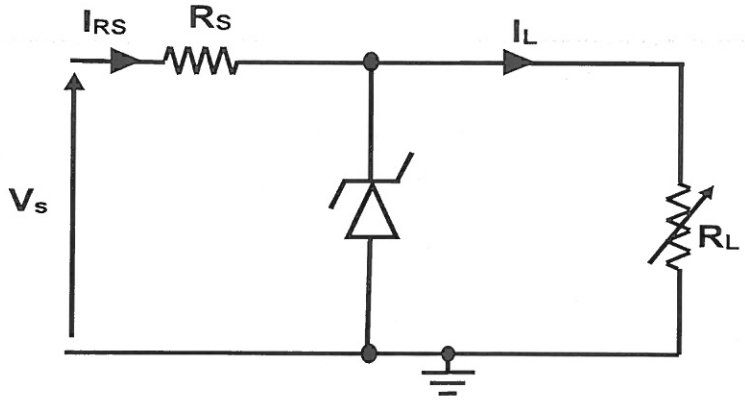

Figure 2.1

2.1 Calculate the value of R_S, giving the value from the E12 range. (6)

2.2 Having calculated R_S, determine whether it will keep the zener current within its maximum and minimum limits. (5)

2.3 Calculate the power rating of R_S. (2)

[13]

QUESTION 3

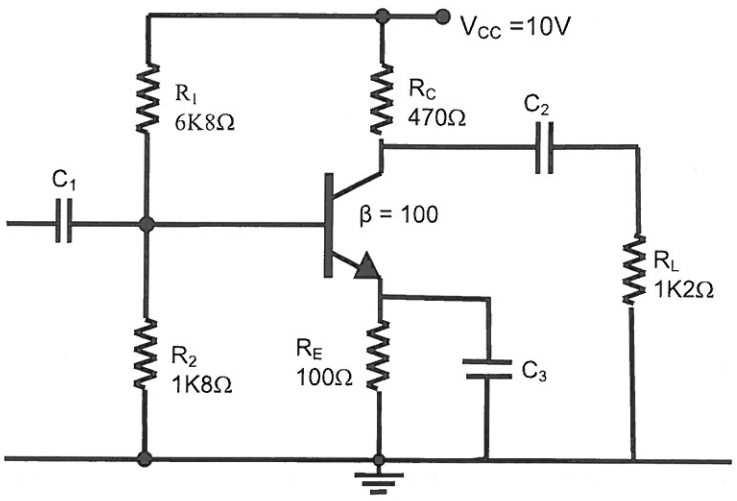

Figure 3.1

Consider the common-emitter circuit diagram in Figure 3.1

3.1 Conduct a DC analysis on the circuit to find its quiescent collector current (I_{cq}). (6)

3.2 Deduce values of h_{fe} and h_{ie} for the transistor. (3)

3.3 Sketch and label the h-parameter small signal model circuit for the circuit. (7)

3.4 Calculate the values for Z_{in}, Z_{out}, A_i and A_v for the circuit (clearly show all working). (8)

[24]

QUESTION 4

A self-bias common source amplifier circuit is shown below in Figure 4.1.

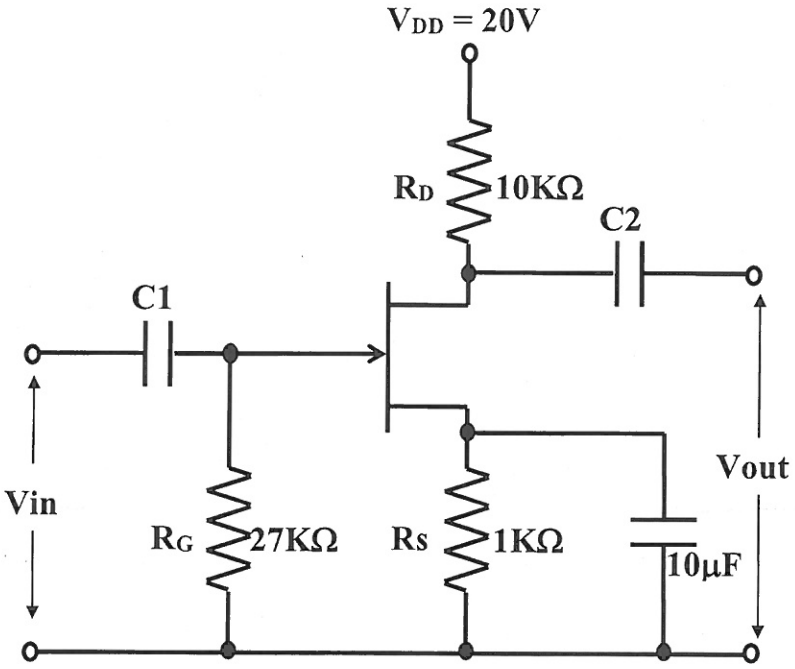

Figure 4.1

Yos = can be ignored; I_{DSS} = 10mA; $V_{GS\,off}$ / Vp = -4V

4.1 Determine, using ordinary graph paper, the values of V_{GSQ} and I_{DQ}. (14)

4.2 Draw the equivalent small signal model of the amplifier. (2)

4.3 Formulate the expressions for

4.3.1 Z_{in} (input impedance) (2)

4.3.2 Z_{out} (output impedance) (1)

4.3.3 A_v (voltage gain) (5)

[24]

TOTAL MARKS : 100

ELECTRONICS II EEL2211 *MULTIPLE CHOICE ANSWER SHEET*
((Place this answer sheet into your script)

STUDENT NAME: _____

STUDENT NUMBER: _____

ANSWER SHEET FOR QUESTION 1

	ANSWER			
QUESTION	**A**	**B**	**C**	**D**
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ELECTRONICS II EEL2211 ***MULTIPLE CHOICE ANSWER SHEET***
((Place this answer sheet into your script)

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