PROGRAM	:	NATIONAL DIPLOMA *ENGINEERING: COMPUTER SYSTEMS* *ENGINEERING: ELECTRICAL*
SUBJECT	:	**ELECTRONICS II**
CODE	:	**EEL2211**
DATE	:	SUMMER SSA EXAMINATION 2015 9 DECEMBER 2015
DURATION	:	(SESSION 1) 08:00 - 11:00
WEIGHT	:	40 : 60
FULL MARKS	:	100
TOTAL MARKS	:	100

EXAMINER	:	DR THOKOZANI C SHONGWE
MODERATOR	:	MR PJJ VAN ZYL 080817622
NUMBER OF PAGES	:	8 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

1.1 What do you need to completely describe or define a waveform/signal?

a) Shape, Frequency and Time period
b) Time period, Shape, and Amplitude
c) Shape, Amplitude and power
d) Current, Voltage and Resistance

1.2 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.

1.3 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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

1.10 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

1.11 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

1.12 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 %

1.13 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) $I_O = h_{12} \times Vo + h_{22} \times V_O$
d) $I_i = h_{21} \times I_O + h_{22} \times V_O$

1.14 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

1.15 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

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

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

1.17 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

1.18 A MOSFET

a) Is a device made of metal and co-oxide
b) Is a substitute for a BJT
c) Is a linear switching device
d) Is a device with 4 terminals

1.19 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

1.20 The cut-off point for any filter is

a) At the point where the voltage is a maximum
b) At the point where the current reaches infinity
c) At the point where the gain is half the original gain
d) At the point where the gain is equal to 3dB

1.21 What is negative feedback voltage?

a) Feedback from a load to a diode
b) Feedback of a negative voltage
c) A voltage that is out of phase with the original input
d) A voltage that is used to switch a device from the active to the passive state.

1.22 Negative feedback modifies the following characteristics of an amplifier:

a) Gain, bandwidth, frequency
b) Impedance, frequency, bandwidth
c) Noise, frequency, gain, bandwidth, impedance
d) Impedance, bandwidth, gain

1.23 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

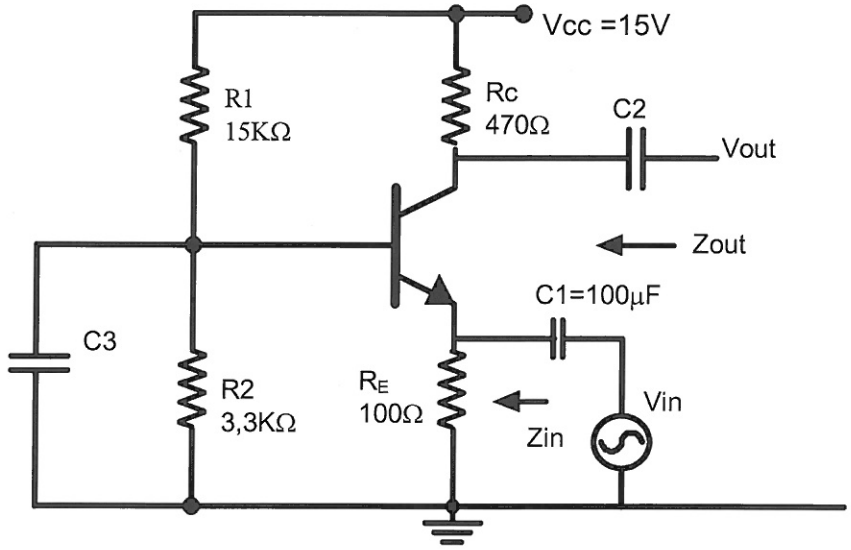
1.24 The term bandwidth can be defined as .....

a) The range of frequencies over which Vo is measured
b) The range of frequencies over which Vo is stable
c) The range of frequencies over which Vo is + 90% of Vo max
d) The range of frequencies over which Vo is + 71% of Vo max

[24]

QUESITON 2

Use the figure below to give an analysis of the h-parameter model of a common emitter amplifier circuit.



2.1. Draw and label a complete circuit of the h-parameter small signal model of the circuit above. All four h-parameters must be clearly indicated. (10)

2.2 Give expressions for the following:

2.2.1 Input impedance (Z_i) (3)

2.2.2 Output impedance (Z_o) (3)

2.2.3 Voltage gain (A_v) (3)

2.2.4 Current (A_i) (2)

2.2.5 Power gain (A_p) (2)

[23]

QUESTION 3

Consider a voltage-divider common source amplifier circuit for an N-channel JFET. The following information regarding the JFET amplifier is relevant:

I_{DSS} = 10mA, Yos = may be ignored, V_{GS} off = -4V (Vp) and the supply voltage is 20V.

The resistors that form the voltage divider, provides a dc gate voltage Vg = 4V.

The value of the source resistance Rs = 1kΩ (bypassed by a capacitor) and the value of drain resistance R_D = 10kΩ.

Answer the following questions regarding the amplifier:

5.1 Sketch a fully labelled diagram of the circuit. (2)

5.2 Determine the operating points (I_{DQ} and V_{GSQ}) graphically by making use of the sheet of graph paper (to be handed in with your answer script). (13)

5.3 Sketch the fully labelled small-signal equivalent model of the amplifier. (2)

5.4 Determine the voltage gain of the amplifier. (6)

[23]

QUESTION 4

4.1 A voltage regulator is required to provide a steady, regulated output voltage of 14 V at a maximum load of 60 mA while the input voltage varies between 15 V and 18 V.

4.1.1 Calculate the maximum rated current value of a zener diode to be used. (3)

4.1.2 Calculate the minimum power rating of a zener diode that could safely be used. (3)

4.1.3 If a 5 W rated zener diode was used, calculate the range of possible R_S (current limiting resistor) values and hence suggest a suitable standard E12 value (7)

4.2 Draw a circuit diagram of a transistor voltage regulator which is a shunt voltage regulator. Your circuit diagram should have at least the following components: zener diode, R_S (current limiting resistor), BJT transistor and R_L (load resistor).

Also label the input/supply voltage (V_S), the output voltage (V_O) and load current (I_L) (7)

NOTE: Marks are awarded for correct placement of the components and labels in your circuit diagram.

[20]

QUESTION 5

Explain, using suitable sketches where possible, the following:

6.1 Cross-over distortion

6.2 Complementary symmetry push-pull amplifier

6.3 Class-AB

6.4 Harmonic distortion

6.5 Phase splitter **[10]**

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**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30