FIJI NATIONAL UNIVERSITY

COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE III IN ELECTRICAL ENGINEERING-STAGE 3

UNIT CODE: EEC333

TITLE: ELECTRONICS FOR ELECTRICIANS 1

FINAL EXAMINATION – QUARTER 3, 2019

ROOM: AS PER TIMETABLE
TIME: 2 HOURS & 10 MINUTES

INSTRUCTIONS TO STUDENTS'

1. You are allowed 10 minutes Extra reading time during which you are NOT to write.

2. Begin each section on a fresh page and use both sides of the sheet.

3. Write your candidate-number at the top of each attached sheet

4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with string

5. For all sheets of paper on which rough/draft work has been done, cross it though and you MUST ATTACH to your answer scripts.

6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.

7. ANSWER ALL QUESTIONS.

8. Show all workings where necessary.

9. Do not use programmable calculators, especially the ones that does the conversions of number systems.

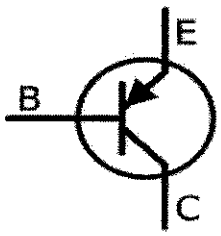
*10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE ROOM!***

SECTION A: MULTIPLE CHOICE [20 MARKS]

Choose the appropriate answer from each question and write it alongside the question number in your answer sheet. .Each question is worth 1 mark.

1. A *pn* junction allows current flow when
   A. the *p*-type material is more positive than the *n*-type material.
   B. the *n*-type material is more positive than the *p*-type material.
   C. both the *n*-type and *p*-type materials have the same potential.
   D. there is no potential on the *n*-type or *p*-type materials.

2. Name the component as pictured?



   A. NPN transistor
   B. Light dependent transistor
   C. PNP transistor
   D. Phototransistor

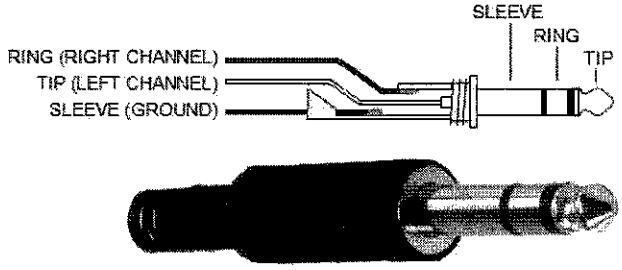
3. A bidirectional thyristor is the
   A. 4-layer diode
   B. SCR
   C. triac
   D. silicon-controlled switch

4. The important features to consider when selecting a switch are
   A. contacts and ratings.
   B. ratings and method of operation.
   C. contacts and method of operation.
   D. contacts, ratings and method of operation.

5. Name the switch that will ONLY make contact if you press it.
   A. Toggle switch
   B. Push button switch
   C. Slide switch
   D. DIP switch

6. The advantage of using a ribbon cable in digital communication is that digital information can be transmitted _____.
   A. very slowly
   B. at a moderate rate
   C. Long distances
   D. very quickly

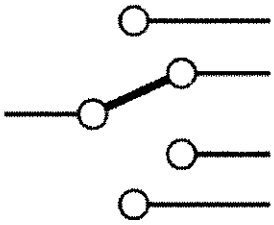
7. Name the plug is shown below?



A. Audio Jack Plug
B. DC Power Plug
C. Phono Plug
D. 3 Pin Plug

8. The forward voltage drop across a silicon diode is about _____.
A. 0.7 V
B. 10 V
C. 3 V
D. 0.3 V

9. The switch circuit symbol shown below is of a

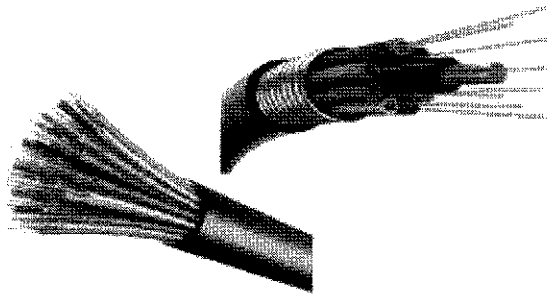


A. Single pole double throw switch
B. Push to make switch
C. Push to break switch
D. Rotary Switch

10. BNC plugs and sockets are designed for screened cables carrying
A. low current signals.
B. high current signals.
C. low frequency signals.
D. high frequency signals.

11. Standard TTL circuits operate with a __ volt power supply.
A. 3 V
B. 5 V
C. 9 V
D. 12 V

12. Identify the type of cables shown below.



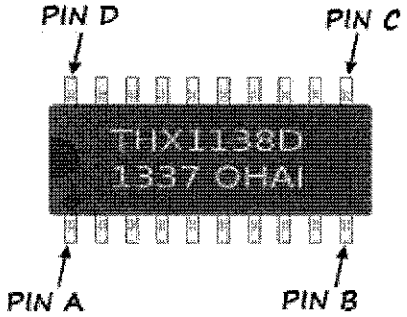
A. Coaxial cable
B. UTP cable
C. Fiber optic cable
D. STP cable

13. A thyristor that looks like two back-to-back 4-layer diode is the _____
A. SCR.
B. Triac.
C. SCS.
D. diac.

14. A bipolar junction transistor is a _____operated device.
A. voltage
B. current
C. both voltage and current
D. power

15. The most commonly used semiconductor in the manufacture of a transistor is
A. silicon
B. carbon
C. germanium
D. none of the above

16. Identify pin number 20 of the IC shown



A. PIN A.
B. PIN B.
C. PIN C.
D. PIN D.

17. A Darlington pair is _____ transistors connected together to give a very high current gain.
    A. 4
    B. 3
    C. 2
    D. 1

18. Which of the following actuators converts energy formed by vacuum or compressed air at high pressure into either linear or rotary motion?
    A. Pneumatic Actuator
    B. Hydraulic Actuator
    C. Electrical Actuator
    D. None of the above

19. Choose the component that contains discrete circuitries?
    A. Transistor
    B. Inductor
    C. Capacitor
    D. Integrated circuit

20. The purpose of a crowbar circuit is to protect a load from
    A. excessive ripple.
    B. low-voltage.
    C. over-voltage.
    D. all of the above.

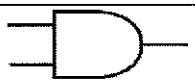
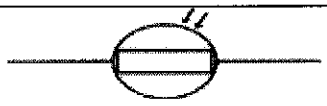
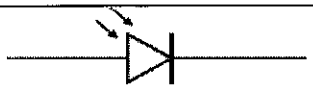
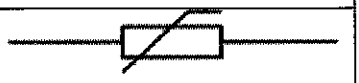
SECTION B: FILL IN THE BLANKS [20 MARKS]

Fill in the Blanks by drawing the circuit symbol and stating the function of the component in the circuit.

COMPONENT	*CIRCUIT SYMBOL*	*FUNCTION IN THE CIRCUIT*
a). Diode		
b). Triac		
c). SPST Relay		
d). Transformer		
e). SPDT switch.		

SECTION C: MATCHING – component symbols (10 MARKS)

Match the diagrams to the appropriate answer by write the correct alphabet against the question number in your answer booklet. Each question is worth 1 mark.

1	NPN Transistor	A	
2	Light emitting diode	B	
3	SCR	C	
4	AND gate	D	
5	Thermistor	E	
6	Transformer	F	
7	Push button switch	G	
8	LDR	H	
9	Photodiode	I	
10	Diac	J	

SECTION D: [50 MARKS]

1. The Transistors can be used in several applications. Name the 2 applications of Bipolar Junction Transistor (BJT). (2 marks)

2. Briefly explain the test for a good NPN transistor using a digital multimeter. (4 marks)

3. A transistor data sheet is given below.

TYPE	CASE	POL MAT	V_{CE}	V_{CB}	$I_{C\,mA}$	V_{CES} @$I_{C\,mA}$	H_{fe}@ $I_{C\,mA}$	P(TOT) mW	USE	EQUIVALENT
BD140	TO-126	PS	80	100	1.5A	0.5@500	40@250	8W	G.P. o/p	40410
BC107	TO-18	NS	45	50	100	0.25@10	110@450	300	G.P.S. S. amp	BC207, BC147, BC182
BC559	TO-92 VAR 1	PS	30	30	100	0.65@100	125@800	500	G.P.S. S. amp	BC159
2N3055	TO-3	NS	60	70	15 A	1.1@4A	20@70 4A	115W	G.P. power	BDY 20
TIP 3055	TOP-3	NS	70	100	15 A	1.1@4A	20@ 4A	90W	Power output	MJE 3055

Determine the:

i) current gain of BC107 and what current can this transistor operate from. (2 marks)

ii) material used in all transistors. (1 mark)

iii) Which transistor can be used instead of BC559? (1 mark)

iv) power dissipation of BC559. (1 mark)

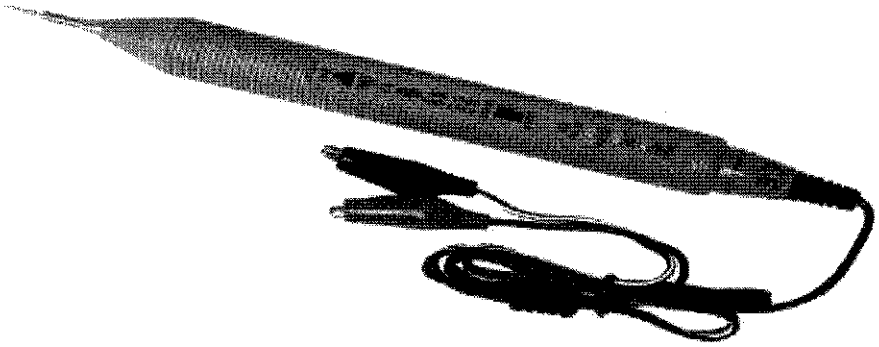
v) package of MJE3055. (1 mark)

vi) polarity of the BC182 transistor. (1 mark)

4. State two advantages and two disadvantages of relay. (4 marks)

5. There are several terms that are used to describe switch contacts. Explain the following terms: (4 marks)
   i) Pole
   ii) Throw
   iii) Way
   iv) Momentary

6. Identify the test instrument shown below and explain the function of it. (4 marks)



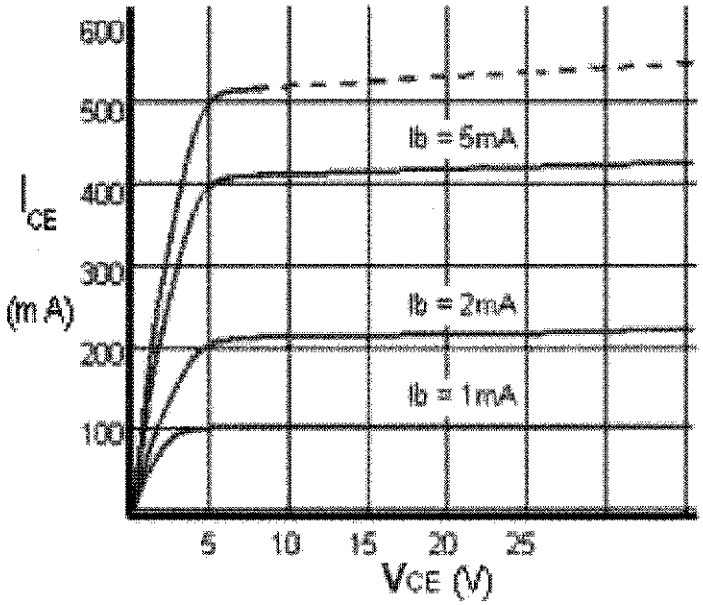
7. Draw the circuit symbol and truth table for OR gate. (3 marks)

8. State 3 applications of thyristor. (3 marks)

9. Explain the term sensors and list down any 3 sensors? (4 marks)

10. What is an actuator? (2 marks)

11. Figure below shows the output characteristic for an n-p-n silicon transistor.

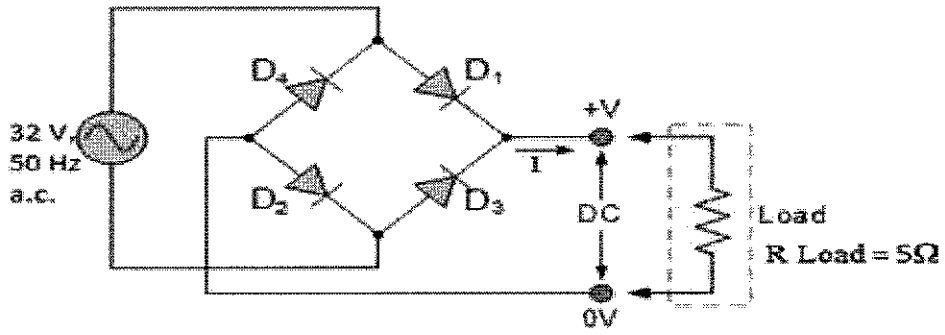


When the collector-emitter voltage is 15V and the base current is 1mA, determine;

A. the value of collector current, (2 marks)

B. the static value of output resistance. (2 marks)

12. For the circuit shown below, determine the following:



a. Identify the circuit. (1 mark)

b. When D_1 and D_2 are forward biased, what happens to D_3 and D_4? (2 marks)

c. Draw the input and output waveform? (2 marks)

13. A part of datasheet is shown below. Answer the questions that follow.

DM74LS08 Quad 2-Input AND Gates

74LS08
Quad 2-Input AND Gates

General Description

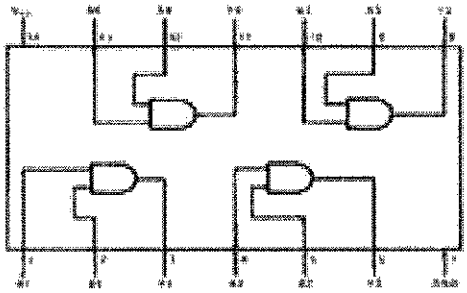
This device contains four independent gates each of which performs the logic AND function.

Ordering Code:

Order Number	Package Number	Package Description
DM74LS08M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
DM74LS08SJ	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74LS08N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram



Function Table

$Y = AB$

Inputs		Output
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

H = HIGH Logic Level
L = LOW Logic Level

DM74LS08

Absolute Maximum Ratings(Note 1)

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note 1: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

Recommended Operating Conditions

Symbol	Parameter	Min	Nom	Max	Units
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{IH}	HIGH Level Input Voltage	2			V
V_{IL}	LOW Level Input Voltage			0.8	V
I_{OH}	HIGH Level Output Current			−0.4	mA
I_{OL}	LOW Level Output Current			8	mA
T_A	Free Air Operating Temperature	0		70	°C

a. Which gate is demonstrated is this datasheet? (1 mark)

b. How many gates are in this single package? (1 mark)

c. Is this a TTL or CMOS? (1 mark)

d. What should be the normal supply voltage for this IC? (1 mark)

THE END