Modalities

1. An examinee shall not attend her/his college in person to sit for the examination of a practical paper. Examinee shall

    (a)   write her/his answer with BLACK INK only.

    (b)   must attach a scanned copies of her/his admit card of previous examination and the registration certificate at the end of the answer script.

    (c)   scan the whole answer script in a single .pdf file. If it is instructed to use separate answer scripts for different modules/units, if any, examinee must do accordingly, but she/he shall create a single .pdf file for the answer script. There will be exactly one .pdf file for each examinee.

    (d)   upload her/his answer script through proper web portal to submit.

2. The full marks and duration of examination of a paper shall be in accord with those specified by the University of Calcutta. The examination of a paper shall consist of three parts, viz., Internal Examination, Theory and Practical. **An examinee must use separate answer scripts for the three parts but scan the whole answer script(answers, admit card and registration certificate) in a single .pdf file and upload.**

3. For examinations of a practical paper, examinees need not submit their laboratory work book, neither they have to face any viva. Examinees shall have to answer the questions following the instructions given in the question paper. Examinees shall use her/his own graph-papers to draw graphs(if any) in practical papers and attach them at proper positions of the answer script. Examinees shall draw circuits and graphs   with BLACK INK only.

B.Sc. Semester-4 Honours Examination -2020

PHSA   **PAPER- CC-10(Analog Electronics)**   **FM-50**

Use separate answer scripts for Internal, Theory and Practical examinations.

INTERNAL ASSESSMENT -10 marks

1. Answer *any five* questions: 2x5=10

a) What are load- line and Q- point for a transistor?   2

b)The band gap of a specimen of GaAs is 1.95 eV. Determine the wavelength of the electromagnetic radiation emitted upon recombination of holes and electrons.   2

c) How is the depletion region formed in p-n junction?   2

d) Explain the variation of width of depletion layer with biasing   2

e) Draw the circuit diagram of a practical integrator circuit using an OP AMP.   2

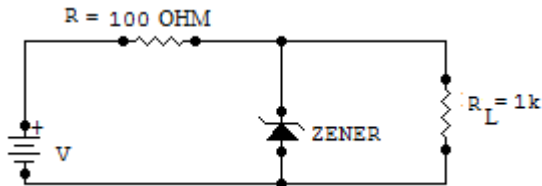f) How the internal impedance of a voltmeter can be increased using an OP AMP   2

PHSA- CC-10(Analog Electronics)

THEORY -25

Answer **question no. 2** and any **two** from the rest in this group.
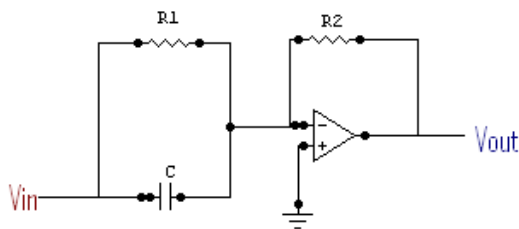
2.

R = 100 OHM

$R_L = 1k$

ZENER

V

The 12 V ,0.36 W, Zener diode operates at a minimum zener current of 2 mA. Determine the limits between which the supply voltage V can vary without loss of regulation in the circuit.   5

OR

For the following circuit show the output voltage is

$$V_{Out} = -\frac{R_2}{R_1}V_{in} - CR_2\frac{dV_{in}}{dt}$$ 5

R1   R2

Vout

C

Vin

3.

a) Draw the circuit diagram of a transistor for drawing the static characteristics of an n-p-n transistor. Sketch the output characteristics of the transistor and indicate different regions of the characteristics.

2+2+2

b) Define the hybrid parameters of a transistor. Why they are called hybrid?   2+2
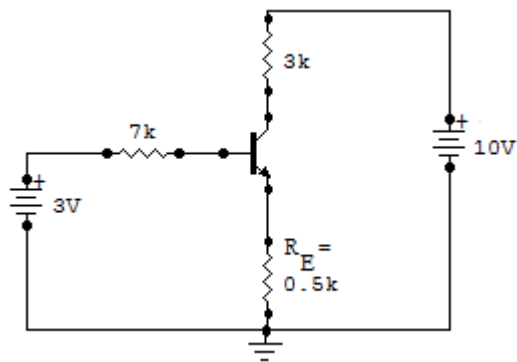
4.

a) For a BJT define α and β. Find the relation between them. 1+1

b) Draw the static characteristics of an n-channel JFET and explain the three regions. 1+3

c) Explain the principle of LED mentioning the role of direct band gap and indirect band gap of semiconductors 4

5.

a)

Assume β=100.

    i)   Determine if the Si transistor is in the cut off, saturation or in the active region .
    ii)   Calculate voltage V_o between collector and ground.
    iii) Obtain the minimum value of the resistance R_E for which the transistor is in the active region.

        (Given: $V_{BE,sat}$ = 0.8 V, $V_{CE,sat}$ = 0.2 V) 2+2+2

b) Draw the circuit diagram using OP AMP for solving the following simultaneous equations

5x+2y=12

2x+3y=6 4

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PRACTICAL-15

Answer *any one* of the following questions:

6.

(a) Draw the circuit diagram of a non-inverting amplifier using OPAMP. How the input offset voltage is being nullified before starting of the experiment?

b) Write down the expression of gain of the non-inverting amplifier and mention the notations used.

c) Following input and output data for a non-inverting amplifier experiment are recorded

V_{in} (Volt)	V_{out} (Volt)
-0.60	-11.80
-0.50	-11.50
-0.40	-9.25
-0.20	-4.20
0.00	0.00
0.20	4.32
0.40	9.31
0.50	11.45
0.60	11.20

Draw V_{out} vs. V_{in} curve in a mm graph paper and hence find the gain of the circuit. Can you predict the resistances used for the circuit?

(2+ 2)+ 1+(5 + 3 + 2)

7.

a) Draw the circuit diagram of an integrator circuit using an OPAMP, where 100 KΩ register is connected across the capacitor used in the circuit. Mention the values of the resistances and capacitor when operating frequency of the integrator is above 10 KHz.

b) Draw the schematic diagram of V_i (input rms voltage)/V_{out} (output rms voltage) vs. f (Frequency) curve. How can you estimate the face value of the capacitor used for the experiment from the curve? What is the utility of the high resistance connected parallel to the capacitor?

(3 + 3) + (3 + 3 + 3)