

20P109

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Name:

Reg. No.....

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2020

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P PHY1 C04 – ELECTRONICS

(Physics)

(2019 Admission onwards)

Time: Three Hours

Maximum: 30 Weightage

Section A

Answer *all* questions. Each question carries 1 weightage.

1. Arrive at the expression for pinch-off-voltage, from the expression for space charge width $W(x)$ at a distance x along the conducting channel of FET.
2. Differentiate between a Depletion MOSFET and an Enhancement MOSFET.
3. What is the physical significance of fill factor of a solar cell? What is the maximum value possible for fill factor?
4. Explain the working of an opamp comparator.
5. What is Butterworth filter? What is the minimum condition imposed on pass band gain of a second order Butterworth filter?
6. With reference to a bode plot, discuss stability of an electronic circuit.
7. Briefly explain the schematic diagram of a cascade counter that can count up to 9999 using decade counters.
8. Discuss the working principle of CCD.

(8 x 1 = 8 Weightage)

Section B

Answer any *two* questions. Each question carries 5 weightage.

9. List any four major differences between JFET and bipolar transistor. Discuss the self bias and potential divider biasing of JFET. Show that increasing the value of R_s results in lower the operating drain current.
10. Discuss the concept of negative differential resistance and explain the mechanism in tunnel diode with the help of energy band diagram. Also mention one application of tunnel diode.
11. Explain a basic opamp integrator and differentiator. Derive the expression for output voltage and gain of the circuit. Discuss its frequency response and the need for modification of these basic circuits to make it a practical circuit.

12. How does a R-2R ladder D/A converter works. Explain how the weightage of various digital input lines are effectively different.

(2 x 5 = 10 Weightage)

Section C

Answer any *four* questions. Each question carries 3 weightage.

13. A FET amplifier in common drain amplifier configuration has an amplification factor of 20 and has r_d of 200 K ohm. A resistance R_L of 100 K ohm is placed in the drain circuit and R_s is 150 K ohm. Calculate the output impedance and voltage gain.
14. Explain the working of MOSFET as a switch.
15. A noise of 3 millivolt (peak to peak) is introduced at the input of an opamp based integrator where RC is 1second. Find out value of noise at the output. What would be the value of the noise signal if the integrator is replaced by a differentiator, where RC is 1 second? In which case is the amplitude of noise at the output higher ? Frequency of the noise voltage is 50 Hz.
16. Differentiate between photoconductor and photodiode.
17. If the output of an opamp inverting amplifier is a square wave of amplitude 0.44 V, calculate the amplitude of the input voltage. Draw the sketch of output in correspondence with input signal. R_{in} is 100 K ohm and R_f is 22K ohm.
18. A four input truth table has a high output for the following conditions 0111, 1100, 1101, 1111, 1110, 1001, 1011 and 1010, with all the other input conditions resulting in low output. Derive at the sum of product equation using K map and realize the situation with logic gates.
19. Discuss why race around condition happen in J K flip flop and how it can be avoided.

(4 x 3 = 12 Weightage)
