FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025
(Regular/Improvement/Supplementary)

PHYSICS
FPHY1C04- ELECTRONICS

Time: 3 Hours **Maximum Weightage: 30**

Part A: Short answer questions. Answer *all* questions. Each carries *one* weightage.

1. Draw the symbol of depletion MOSFET. D- MOSFET can be used in both depletion mode and enhancement mode. Check the correctness of the statement.

2. What does CMOS stand for? Give any one application of CMOS.

3. An op-amp can amplify both ac and dc voltages. Establish the statement with the help of frequency response curve for the op-amp.

4. Why two biasing sources are necessary for the working of an op-amp?

5. Define CMRR and slew rate. Give the value for 741 op-amp with units.

6. Draw the circuit of a lead compensated operational amplifier.

7. Define roll of rate for a filter. What is its value for a third order filter?

8. What is the operational difference between static and dynamic RAM?

(8 × 1 = 8 weightage)

Part B: Essay questions. Answer any *two* questions. Each carries *five* weightage.

9. Explain the V I characteristics of a JFET. Explain the working of a common source amplifier deriving the expression for gain?

10. Give the construction and working of a *pn* junction solar cell. Define short circuit current, fill factor and efficiency. Write down the principle of constructing visible and IR LEDs.

11. Show that the cut off frequency for the second order low pass Butterworth filter is

$$f_H = \frac{1}{2\pi\sqrt{R_2 R_3 C_2 C_3}}$$

12. Describe the basic construction and operation of an asynchronous counter.

(2 × 5 = 10 weightage)

(P.T.O.)

Part C: Problems. Answer any *four* questions. Each carries *three* weightage.

13. Draw the volt amp characteristics of tunnel diode. Define: (a) the tunneling current, (b) the injection current, and (c) the total current.

14. Write down the expression for external quantum efficiency of a photo diode. Calculate the external quantum efficiency. Given the absorption coefficient is 4×10^4 cm^{-1} and surface reflectivity is 0.1 for a Si p-n photodiode. The thicknesses of p and depletion regions are both 1 m and the internal quantum efficiency is 0.8.

15. Design a 60 Hz active notch filter.

16. In a practical integrator circuit $R_1 C_F = 1$ second, and the input is a step voltage (dc) of 2V for a duration of 4 sec. Determine the output voltage and sketch it.

17.
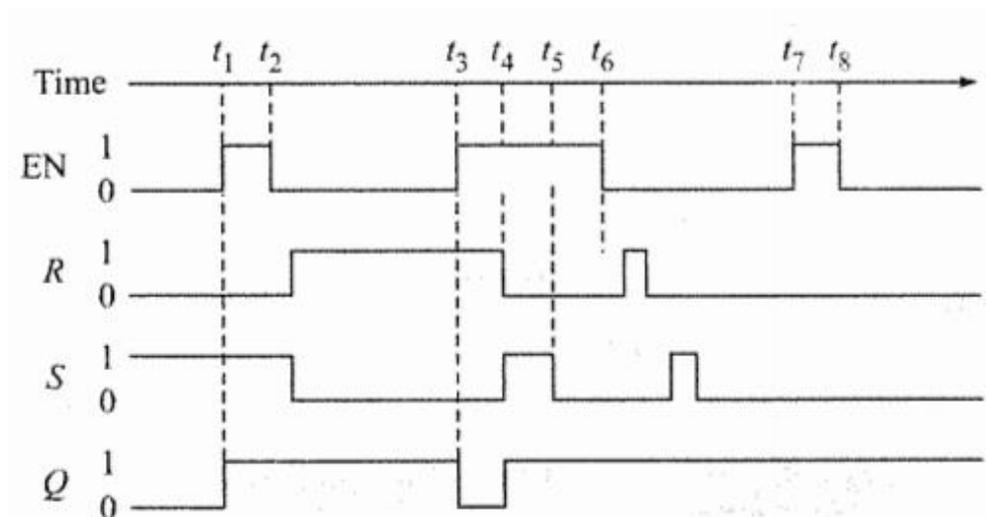
Using this input find the output wave form for a clocked RS Flip Flop.

18. How many Flip Flops are required to construct mod 6 and mod 9 counters? Give the largest binary number representable by mod 6 ripple counter.

19. What is a photoconductor? Obtain the expression for photocurrent.

(4 × 3 = 12 weightage)