

- (b) Draw the circuit diagram of an Op-amp as differentiator and find an expression for its output voltage. Draw the output waveform when the input to the differentiator is a square wave. (5)
- (c) How the Op-amp is used as a zero-crossing detector and a square wave generator? (5)

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December 2023

B.Sc. (H) Physics, Semester-III
ANALOG SYSTEMS AND APPLICATIONS (BPH-303A)

Time : 3 Hours] [Max. Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any four questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.
4. Use of non-programmable simple calculator is allowed.

PART-A

1. (a) What are degenerate semiconductors? Explain. (1.5)
- (b) Explain the working principle of a solar cell. Define the fill factor. (1.5)
- (c) Define rectifier efficiency. Calculate its value for FWR. (1.5)
- (d) Show that $I_C = \beta I_B + (1 + \beta) I_{CBO}$, where the symbols have their usual meanings. (1.5)
- (e) Determine I_e and I_c for a transistor which has a current gain $\alpha = 0.98$ and base current $I_b = 100 \mu A$. (1.5)

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