PG Odd Semester (CBCS) Exam., December—2016

PHYSICS

(1st Semester)

Course No. : PH–104 (C)

(Electronics)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

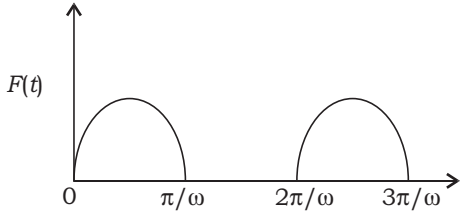
The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* State and prove maximum power transfer theorem. 2+7

(b) Obtain the Laplace transform of half-wave rectifier function as shown



where

$$F(t) = \begin{cases} \sin t; & 0 \quad t \quad — \\ 0; & — \quad t \quad \frac{2}{—} \end{cases}$$

with period T $\frac{2}{—}$. 6

2. *(a)* Given a function

$$f(x) = \begin{cases} 0; & 0 \quad x \quad l \\ 1; & l \quad x \quad 2l \end{cases}$$

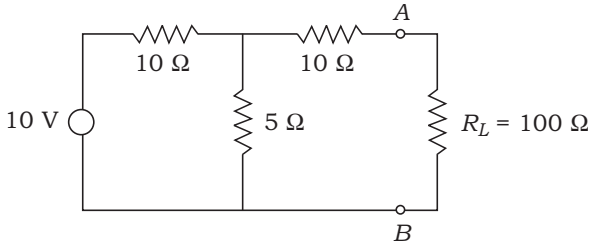
Explain $f(x)$ in a Fourier series of period $2l$. 7

(b) Find the Fourier transform of the Gaussian distribution function

$$f(x) \quad Ne^{\ x^2}$$

where N and are constants. 3

(c) Using Thevenin's theorem, calculate the current in R_L in the given circuit : 5



UNIT—II

3. *(a)* Describe the construction and working of an *n*-channel function field-effect transistor. 7

(b) Calculate the frequency of oscillation for a phase-shift oscillator. Also discuss the condition for sustained oscillation. 8

4. *(a)* Explain the concept of virtual ground in an op-amp with diagram. 3

(b) Explain how an op-amp can be used as—

(i) adder;

(ii) subtractor;

(iii) integrator;

(iv) differentiator. 3×4=12

UNIT—III

5. *(a)* Explain how a NOT gate can be realised using transistor. 5

(b) Prove the following Boolean identity : 3

$$\overline{(A\overline{B} \quad \overline{A}B)} \quad AB \quad \overline{A}\overline{B}$$

(c) Discuss full adder. How can the truth table of full adder be realised with logic gates? 7

6. *(a)* Discuss *J-K* master-slave F/F. 7

(b) Discuss a 4-bit ripple counter. 8

UNIT—IV

7. *(a)* Explain why electrical signals having low frequency cannot be transmitted directly. 3

(b) What is amplitude modulation? Derive an expression (or voltage equation) for an amplitude-modulated wave. What are meant by percentage modulation and modulation index? Show that amplitude-modulated wave can be represented by a carrier wave and two sideband frequencies. 2+5+2+3

8. *(a)* Define frequency modulation. 2

(b) Obtain an expression for a frequency carrier with sinusoidal modulation. 5

(c) Discuss the frequency spectrum of frequency-modulated wave and show that the total power in modulated waveform remains constant for all values of m_f. 8

UNIT—V

9. *(a)* Discuss, with a neat diagram, construction and looping of a Cathode Ray Oscilloscope (CRO). 10

(b) How can you measure an unknown frequency with CRO? 5

10. *(a)* Discuss different types of noise in electronic communication system. 10

(b) Calculate the noise voltage across a resistor of resistance *R*. 5

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