2025

(Nov–Dec)

FYUP : 5th Semester Examination

MAJOR

PHYSICS

(Electronics–II and Computational Physics–I)

PHY–301

Marks : 75

Time : 3 hours

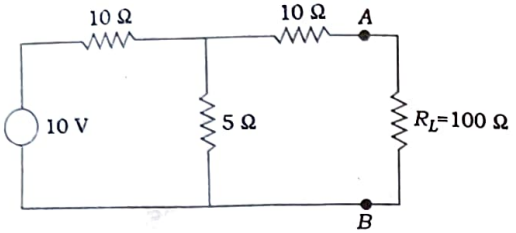
The figures in the margin indicate full marks for the questions

Answer *any* **ten** questions

1. State and prove superposition theorem of network analysis. 7½

2. *(a)* State and explain Thevenin's theorem of network analysis. 1+2=3

(b) Using Thevenin's theorem, calculate the current through R_L in the given circuit : 4½



3. (a) Considering a transistor as a two-port network, define hybrid parameters. 4

(b) What is an amplifier? Based on their operating conditions, how are amplifiers classified? 3½

4. Describe the two-stage *R-C* coupled amplifier with a neat circuit diagram and explain its frequency response. 7½

5. (a) What are field effect transistors (FETs)? Explain the working of a JFET with the help of a diagram. 1+4½=5½

(b) State two differences between FET and BJT. 2

6. (a) State and explain Barkhausen criterion for steady oscillations. 1+2=3

(b) Sketch a Colpitts oscillator circuit and explain its action. 4½

7. (a) What is an OP-AMP? Write down the characteristics of an ideal OP-AMP. 1+2½=3½

(b) Discuss the working of an OP-AMP as an integrator with the help of a diagram. 4

8. What are half-adder and full-adder? Draw the logic block diagram for adding two decimal numbers 7 and 12. Write down the result in binary. 2+4+1½=7½

9. (a) What is a flip-flop? Is there any difference between latch and flip-flop? 1+2=3

(b) What is an *S-R* flip-flop? Give its logic symbol, truth table and circuit realization using NOR gates. 1+1+1+1½=4½

10. What is a multivibrator? With the help of a circuit diagram, describe the operation of a bistable multivibrator. 2½+5=7½

11. What are flowcharts? Develop the relevant flowchart and an algorithm for finding out the real, equal and imaginary roots of the equation $ax^2 + bx + c = 0$, where a, b and c are constants. 1½+6=7½

12. *(a)* What are executable and non-executable statements? Illustrate with suitable examples. 2+2=4

(b) What are formatted and unformatted input statements? Give example of each. 2+1½=3½

13. *(a)* What are control statements? How are they classified? 1½+2=3½

(b) Explain with illustrative examples, the usage of the following FORTRAN statements : 2×2=4

(i) Do loop statement

(ii) Arithmetic IF statement

14. *(a)* Explain briefly the trapezoidal rule of integration in FORTRAN. 2½

(b) Evaluate

$$\int_0^{0\cdot 8} (\log(x+1) + \sin 2x)\, dx$$

using trapezoidal rule with $h = 0 \cdot 1$. 5

15. Estimate the value of $y(0 \cdot 4)$ using the second-order Runge-Kutta method for the equation $\frac{dy(x)}{dx} = x^2 + y$ with $y(0) = 1$, taking the step size of 0·2, correct to four decimal places. 7½

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