

**2024/TDC (CBCS)/EVEN/SEM/
PHSHCC-403T/092**

TDC (CBCS) Even Semester Exam., 2024

PHYSICS

(4th Semester)

Course No. : PSHHCC-403T

(Analog Systems and Applications)

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

UNIT—I

1. Answer any two of the following questions :

2×2=4

- (a) What do you mean by P-type and N-type semiconductors?
- (b) Discuss the energy band description of semiconductors.
- (c) What is a ripple factor? Define filter circuit.

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(2)

2. Answer either (a) or (b) : 6
- (a) What do you mean by d.c. and a.c. resistances of a *P-N* junction diode? Discuss the *V-I* characteristics curve of a *P-N* junction diode. 2+4=6
- (b) Find an expression for efficiency of half-wave rectifier. The applied input a.c. power to a half-wave rectifier is 100 watts. The d.c. output power obtained is 40 watts.
- (i) What is the rectification efficiency?
- (ii) What happens to remaining 60 watts? 3+3=6

UNIT—II

3. Answer any two of the following questions : 2×2=4
- (a) Explain the working principle of photodiode.
- (b) Draw the d.c. load line of a transistor. Define *Q*-point of a biased transistor.
- (c) What do you mean by cut-off and saturation points?

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(Continued)

(3)

4. Answer either (a) or (b) : 6
- (a) Discuss the principle of operation of light emitting diodes. How does LED differ from an ordinary diode? Why is LED not made of silicon or germanium? 2+2+2=6
- (b) Draw the circuit diagram of a transistor in CE mode and then obtain the expression for current gain. 2+4=6

UNIT—III

5. Answer any two of the following questions : 2×2=4
- (a) What do you mean by transistor biasing?
- (b) What are *h*-parameters for a two-port network?
- (c) Why is the fixed bias not preferred over a voltage divider bias? Explain.
6. Answer either (a) or (b) : 6
- (a) Discuss the voltage divider bias technique and obtain the expression for its stability factor.

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(4)

- (b) Obtain the expressions for current gain, input impedance and voltage gain of a transistor amplifier in terms of h -parameter. $2+2+2=6$

UNIT—IV

7. Answer any two of the following questions : $2 \times 2 = 4$

- (a) What do you mean by feedback in amplifiers? Why is negative feedback applied in high gain amplifiers?
- (b) Explain how feedback circuit provides feedback in amplifiers.
- (c) Mention the Barkhausen's criterion for self-sustained oscillations.

8. Answer either (a) or (b) : 6

- (a) Draw the circuit diagram of a two-stage R-C coupled amplifier and explain its frequency response curve.
- (b) Give the principle of operation of Colpitts oscillator. Derive an expression for the frequency of oscillation for Colpitts oscillator. $2+4=6$

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(5)

UNIT—V

9. Answer any two of the following questions : $2 \times 2 = 4$

- (a) Write down the characteristics of an ideal OP-AMP.
- (b) Define CMRR and slew rate of an OP-AMP.
- (c) Mention the characteristics of practical OP-AMP IC-741.

10. Answer either (a) or (b) : 6

- (a) What do you mean by open-loop gain and closed-loop gain of an OP-AMP? Obtain the expression for closed-loop gain of an inverting amplifier using OP-AMP. $2+4=6$
- (b) Discuss how an OP-AMP can be used as integrator and differentiator. Explain the non-inverting mode of operation of an OP-AMP. $4+2=6$

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