

AR16

CODE: 16EC1001

SET-I

**ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(AUTONOMOUS)**

I B.Tech II Semester Supplementary Examinations, February-2022

**ELECTRONIC DEVICES
(Electronics and Communication Engineering)**

Time: 3 Hours

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the Question must be answered at one place

UNIT-I

1. Explain the operation of CRO with a neat block diagram and mention its applications. 14M

(OR)

2. a) Explain the motion of a charged particle under uniform magnetic field. 8M
b) Explain how voltage, current and phase are measured using cathode ray oscilloscope. 6M

UNIT-II

3. a) What is the difference between intrinsic and extrinsic semiconductors? Explain the formation of P-type semiconductor with a neat sketch. 8M
b) Explain the expression for conductivity of a semiconductor and find the intrinsic conductivity for silicon. Assume $n_i = 1.5 \times 10^{10} \text{ cm}^{-3}$, $\mu_n = 1300$ and $\mu_p = 500 \text{ cm}^2/\text{V-s}$ respectively. 6M

(OR)

4. a) Explain the concepts of diffusion and Hall effect. 8M
b) Explain the classification of materials based on energy band diagram. 6M

UNIT-III

5. a) Discuss the V-I characteristics of PN junction diode and its dependency on the temperature. 8M
b) Derive the expression for transition capacitance of a PN junction diode. 6M

(OR)

6. a) Explain the concept of Zener break down and application of Zener diode as voltage regulator. 8M
b) Discuss the principle of LED and its applications. 6M

UNIT-IV

7. a) Explain the input and output characteristics of bipolar junction transistor in CE configuration. 10M
b) Calculate the base current in a BJT with current gain $\alpha = 0.98$ and emitter current 10mA. 4M

(OR)

8. a) Explain how transistor acts as an amplifier. 8M
b) Explain different current components in bipolar junction transistor. 6M

UNIT-V

9. a) Explain n channel JFET characteristics. 8M
b) Discuss the differences between BJT and JFET. 6M

(OR)

10. a) Discuss the V-I characteristics of UJT with a neat diagram. 8M
b) Derive the relation between r_d , g_m and μ , related to JFET. 6M

ENGINEERING MATHEMATICS -II
(Common to EEE & ECE)

Time: 3 Hours

Max Marks: 70

PART-A

ANSWER ALL QUESTIONS

[1 x 10 = 10 M]

1. a) Briefly write the condition for initial approximation for solving a transcendental equation.
- b) Write the normal equations of the straight line $y=a+bx$ by least squares method.
- c) Prove that $\nabla = 1 - E^{-1}$.
- d) What is the rule required for Simpson's 1/3 rule for number of divisions of the interval?
- e) Write the formula used in modified Euler's method.
- f) What are multi step methods?
- g) Find $L\left[e^{-2t} \sin 4t\right]$ if $L(\sin 4t) = \frac{4}{s^2 + 16}$.
- h) Find the L.T of the function $\sin^2 t$ if $L(\cos 2t) = \frac{s}{s^2 + 4}$.
- i) Write the auxiliary ODEs of the PDE $p(z-y) + q(x-z) = y-x$
- j) Solve : $z = px + qy + \sqrt{1 + p^2 + q^2}$

PART-B

Answer one question from each unit

[5x12=60M]

UNIT-I

- 2 a) The equation $x^3 - 3x + 4 = 0$ has one real root between -2 and -3. Find the root to four places after decimal by false position method. **6M**
- b) Fit a curve $y = ax^b$ to the following data by the method of least squares. **6M**

x	2	4	7	10	20	40	60	80
y	43	25	18	13	8	5	3	2

(OR)

- 3 a) Using Newton-Raphson method find reciprocal of a number. Apply the methods to $N = 24$ to obtain the result correct to 2 decimals by taking the initial approximation as $x_0 = 0.045$. **6M**
- b) Fit a straight line to the following data by the method of least squares. **6M**

x	0	1	2	3	4
y	1	1.8	3.3	4.5	6.3

UNIT-II

4. a) Form the backward difference table of $f(x) = x^3 - 3x^2 + 5x + 7$, for the values of 0,2,4,6,8 and verify for $f(10)$ by interpolation and actual calculation. **6M**
- b) From the following table values of x and $y = e^x$ interpolate value of y when $x = 1.91$ by Gauss forward differences. **6M**

x	1.7	1.8	1.9	2.0	2.1	2.2
y	5.4739	6.0496	6.6859	7.3891	8.1662	9.0250

(OR)

- 5 a Use Gauss backward interpolation formula to find $f(32)$, given that $f(25) = 0.2707$, $f(30) = 0.3027$, $f(35) = 0.3386$, $f(40) = 0.3794$. **6M**

b Given that **6M**

x	4	4.2	4.4	4.6	4.8	5.0	5.2
logx	1.3863	1.4351	1.4816	1.5261	1.5686	1.6094	1.6487

Evaluate $\int_4^{5.2} \log x dx$ by Simpson's 3/8 rule.

UNIT-III

6. Solve the ODE $\frac{dy}{dx} = xe^y$, $y(0) = 0$ by Picard's method upto 2nd approximation. **12M**

Estimate $y(0.3)$, and $y(1)$.

(OR)

- 7 Using modified Euler's method upto 4 approximations, find $y(0.2)$ and $y(0.4)$ given **12M**
 $\frac{dy}{dx} = y + e^x$, $y(0) = 0$

UNIT-IV

8. a Evaluate $\int_0^{\infty} t^3 e^{-t} \sin t dt$ **5M**

- b Evaluate $L^{-1} \left[\frac{s^2}{(s^2 + a^2)(s^2 + b^2)} \right]$ by Convolution theorem. **7M**

(OR)

9. a Evaluate $L(t^2 \cos at)$ **6M**

- b Find $L^{-1} \left[\frac{s^2}{(s^2 + 4)^2} \right]$ by Convolution theorem. **6M**

UNIT-V

- 10 a Solve: $y^2 p - xyq = x(z - 2y)$ **6M**

- b Solve: $(x^2 - y^2 - yz)p + (x^2 - y^2 - zx)q = z(x - y)$ **6M**

(OR)

11. A homogeneous rod of conducting material of length 100 cm has its ends kept at zero temperature and the temperature initially is $u(x,0) = x$ for $0 \leq x \leq 50$ and $100 - x$ for $50 \leq x \leq 100$. Then find the temperature $u(x,t)$ at any time t . **12M**