

I Year B.E/B.Tech
ELECTRICAL AND ELECTRONICS
ENGINEERING (EEE)



MODEL QUESTION PAPERS

(Effective from 2005 admitted batch)

SCHOOL OF DISTANCE EDUCATION
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CONTENTS

| Paper No. | Subject | Page No. |
|------------------|--|-----------------|
| 101 | Mathematics - I | 04 |
| 102 | Mathematics-II | 07 |
| 103 | Physics | 10 |
| 104 | Chemistry | 12 |
| 105 | Computer Programming & Numerical Techniques | 14 |
| 106 | Material Science | 17 |
| 107 | Electronics - I | 18 |

I Year B.E./B.Tech Degree Examinations
MATHEMATICS - I
(Common to All Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry marks

1. a) If $z = \log(u^2 + v)$, $u = e^{x^2}$, $v = 2 \sin(xy)$ find $\frac{\partial z}{\partial x}$
- b) Express $\int_{-\infty}^{\infty} e^{-4x^2} dx$ in terms of gamma function
- c) A lamina with constant density is bounded by the curves.
 $x = y^2 - 3y$ and $x = 2y$. Find by double integration, the mass of the lamina.
- d) Find the distance between the parallel planes
 $3x - y + 2z + 4 = 0$ and $6x - 2y + 4z + 5 = 0$.
- e) Show that the series $\sum_{n=1}^{\infty} \frac{1}{n^3 + n^4 x^2}$ converges uniformly in any interval.
2. a) If v be a function of r where, $r^2 = x^2 + y^2$,

show that
$$\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} = \frac{1}{r} \frac{\partial v}{\partial r} + \frac{\partial^2 v}{\partial r^2}$$

- b) Obtain Taylor's expansion of $Tan^{-1}(y/x)$ about (1,1) upto and including the second degree terms.

3. a) Evaluate $\int_0^a \int_{x/a}^{\sqrt{x/a}} (x^2 + y^2) dx dy$ by changing the order of integration.

- b) Determine the M.I. about the X-axis of the area of a triangle with the vertices A(1,1), B(2,1) and C(3,3).

4. a) Find the equations to the line that intersects the lines $x + y + z = 1$, $2x - y - z = 2$, $x - y - z = 3$, $2x + 4y - z = 4$ and passes through the point (1,1,1)

- b) Find the equation of the sphere having its center on the plane $4x - 5y - z = 3$ and passing through the circle

$$x^2 + y^2 + z^2 - 2x - 3y + 4z + 8 = 0, \quad x - 2y + z = 8$$

5. a) Show that if a series $\sum u_n$ is convergent then

$$\lim_{n \rightarrow \infty} u_n = 0.$$

- b) Test the convergence of the following series

$$\frac{\sqrt{2} - \sqrt{1}}{1} + \frac{\sqrt{3} - \sqrt{2}}{2} + \frac{\sqrt{4} - \sqrt{3}}{3} + \dots$$

6. a) Show that the harmonic series of order p, $\sum_1^{\infty} \frac{1}{n^p}$ converges for $p > 1$ and diverges for $0 < p < 1$.

b) Test for uniform convergence of the following series

$$\sin x - \frac{\sin 2x}{2\sqrt{2}} + \frac{\sin 3x}{3\sqrt{3}} - \frac{\sin 4x}{4\sqrt{4}} + \dots \infty$$

7. Express $f(x) = |x|, -\pi < x < \pi$ as a Fourier series. Hence

obtain $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \dots \infty$.

8. Obtain the half range sine and cosine series for the function

$$f(x) = (x+1)^2, 0 < x < 1.$$

I Year B.E./B.Tech Degree Examinations

MATHEMATICS - II

(Common to All Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory

Answer any four from Questions 2 to 8

1. a) State Culey Hamilton theorem

b) Product of the eigen values of $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is ?

c) Solve $\frac{dy}{dx} + 2x^2 y = 0$

d) Find the complementary function of $(D^2 + 3d + 4)Y = 0$

e) Find the laplace transform of t Sin t.

2. a) Find the rank of $\begin{bmatrix} 5 & 6 & 7 & 8 \\ 6 & 7 & 8 & 9 \\ 11 & 12 & 13 & 14 \\ 16 & 17 & 18 & 19 \end{bmatrix}$

b) For what values of k the equations

$x + y + z = 1, 2x + y + 4z = k, 4x + y + 10z = k^2$ have a solution and solve them completely in each case

3. a) Using elementary row operations find the inverse of

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$$

- b) Reduce the quadratic form $2xy + 2yz + 2zx$ into canonical form.

4. a) Using Gauss elimination method.

$$\text{Solve } 2x_1 + 4x_2 + x_3 = 3, \quad 3x_1 + 2x_2 - 2x_3 = -2$$

$$x_1 - x_2 + x_3 = 6$$

- b) Using iteration method find the largest eigen value and eigen

vector of the matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

5. a) Solve $(2x + y - 3)dx = (x + 2y - 3)dy$

b) Solve $(x^3 dx - y^3 dy) = 3xy(y dx - x dy)$

c) Solve $x p^2 + p - y = 0$

6. a) Solve $\frac{d^2 y}{dx^3} + 2\frac{d^2 y}{dx^2} + \frac{dy}{dx} = e^{2x} + \sin 2x$

b) Solve $\frac{dx}{dt} = 5x + y, \quad \frac{dy}{dt} = y - 4x$

7. a) Find the Laplace transform of $f(t)$ given

i) $f(t) = t e^t \sin t$

ii) $f(t) = \sin t \quad 0 < t < \pi$
 $= 0 \quad t > \pi$

b) Find the inverse transform of

i) $\log\left(\frac{1+s}{s}\right)$ ii) $\frac{e^{-s}}{(s-1)(s-2)}$

8. a) Using convolution theorem find the inverse transform of

$$\frac{1}{(s-1)(s-9)^2}$$

b) Using transform method solve $y'' + 4y' + 3y = e^{-t}$

$$y(0) = y'(0) = 1$$

I Year B.E./B.Tech Degree Examinations

PHYSICS

(Common to All Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory
Answer any four from Questions 2 to 8
All questions carry equal marks

1. a) State and explain entropy.
b) Write the difference between Diffraction and Interference phenomena.
c) Explain Hall effect.
d) Write applications of optical fibers.
e) Explain Type-I and Type-II superconductors.
2. a) State and explain first law of thermodynamics.
b) Describe various operations of Carnot's cycle and derive an expression for its efficiency.
3. a) State and explain Gauss law and discuss the application
b) Discuss the growth and decay of current in an LR circuit.
4. a) Discuss the construction and working of Michelson's interferometer and write applications of Michelson's interferometer.
b) Explain the construction and working of Nicol's prism.
5. a) What is population inversion? Describe the construction and working of He-Ne laser.
b) Write applications of lasers

6. a) What is Piezo electric effect? Describe how this effect can be used to produce ultrasonic waves.
- b) Mention applications of ultrasonic waves.
7. a) Derive Schrodinger time independent wave equation and obtain energy Eigen value and Eigen functions of a particle moving in one dimensional box using Schrodinger wave equation.
- b) State and explain Heisenbergs uncertainty principle.
8. a) Distinguish between metals, semiconductors and insulators based on band theory of solids.
- b) Define Super conductivity, Meisner effect and write applications of Super conductors.

I Year B.E./B.Tech Degree Examinations

CHEMISTRY

(Common to Mechanical, Civil, EEE, ECE Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory

Answer any four from Questions 2 to 8

1. a. Explain hardness of water?
b. What are galvanic cells? Give example?
c) Define HCV and LCV?
d) What are polymers? Classify
e) What are semi conductors?
2. a) What are boiler troubles? Explain.
b) Explain Green house effect
3. Write short notes on
 - a) Break point chlorination
 - b) Desalination
 - c) BOD and COD
4. a) What are defects in solids? Explain
b) Explain about organic semiconductors
5. a) What are primary and secondary cells?
b) Write the working of lead acid battery?

6. a) Differentiate between thermo plastics and thermosetting plastics.
b) Write the synthesis, properties and uses of polyethylene and PVC
7. a) How does the percentage of C,H,N,O,S calculated in a fuel?
b) What is knocking? Explain.
8. Write short note on
 - a) setting and hardening of cement.
 - b) Lubricants
 - c) Paints and Varnishes.

I Year B.E./B.Tech Degree Examinations

COMPUTER PROGRAMMING AND NUMERICAL TECHNIQUES

(Common to All Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory

Answer any four from Questions 2 to 8

All questions carry marks

1. a) What is an algorithm and flow chart ?
b) What is a variable, explain rules to follow in FORTRAN to write a Variable name.
c) What are different data type in C ?
d) Explain False position method.
e) What is numerical integration? Write the formula for Trapezoidal rule.
2. a) Write a flow chart to find biggest of three numbers.
b) Write a program in FORTRAN to find the roots of a given quadric equation.
3. a) Write a flow chart to find HCF a given two integers.
b) Write a program in C to test whether the given integer is prime or not.
4. a) Explain various types of error in numerical computation. Define absolute error, relative error.

- b) Calculate the values of $\frac{(x^2 - y^2)}{(x + y)}$ with $x = 0.4845$ and $y = 0.4800$, using normalized floating point arithmetic. Compare the value with $(x - y)$. Determine relative error of the former.

5. a) Find the root of the following equations correct upto 2 decimal places using false position method.

$$x^3 - 2x^2 + 3 = 0$$

- b) Find the root of the following equation correct upto 2 decimal places using Newton - Raphson method.

$$\sin x = 1 - x$$

6. a) From the following table find the value of $f(x)$ when $x = 0.21$.

| | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|
| x | 0.20 | 0.22 | 0.24 | 0.26 | 0.28 | 0.30 |
| $f(x)$ | 1.6596 | 1.6698 | 1.6804 | 1.6912 | 1.7024 | 1.7139 |

- b) From the following table find the value of $f(x)$ when $x = 4$.

| | | | | | |
|--------|----|----|----|-----|------|
| x | -1 | 0 | 3 | 6 | 7 |
| $f(x)$ | 3 | -6 | 39 | 822 | 1611 |

7. a) Calculate the value of $I = \int_0^{\pi/2} \sin x \, dx$ by Simpson rule with 8 intervals.

b) Solve the following system by Gauss - Elimination method

$$5x - 2y + z = 4$$

$$7x + y - 5z = 8$$

$$3x + 7y + 4z = 10$$

8. a) Use Euler's method to find $y(0.1)$ $y' = x + y$ with $y(0) = 0$ with $h = 0.01$.

b) Use Runge - Kutta method to find

$y(0.2)$ in steps of 0.1

$$\frac{dy}{dx} = x + y^2 \text{ with } y(0) = 1.$$

I Year B.E./B.Tech Degree Examinations

MATERIAL SCIENCE

(Common to EEE & ECE Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory

Answer any four from Questions 2 to 8

All questions carry marks

1. a) Define unit cell of space lattice.
b) Define ferrites with applications.
c) What is meant by Epitaxial process.
d) Write a short note on diffused resistors.
e) Explain superconductor with example.
2. What is meant by imperfections in solids. Write any two dislocations and explain the role of dislocations in crystal growth.
3. Explain polarisability and write a note of frequency dependence of Polarizability.
4. Explain in detail about Fabrication of crystal growth. Write about role of polishing and photo formation of ohmic contacts.
5. Write about principles of IC packing and thin film capacitors.
6. Write about magnetic and dielectric materials of Hard & Soft magnetic materials. Explain about cathode sputtering.
7. Explain high frequency applications of Superconductors and Biofunctional materials.
8. Explain in detail plastic deformation and Electro plating.

I Year B.E./B.Tech Degree Examinations

ELECTRONICS - I

(Common to EEE & ECE Branches)

Time : Three hours

Maximum : 75 Marks

Question 1 is compulsory

Answer any four from Questions 2 to 8

All questions carry marks

1. a) Discuss the behavior of a P-N junction under forward and reverse biasing. (3m)
 - b) Explain the operation of transistor as an amplifier (3m)
 - c) Draw the h-parameter equivalent circuits of a transistor in different configurations (3m)
 - d) Define the following for a JFET
 - i) The Pinch-off voltage
 - ii) Drain resistance
 - iii) Transconductance (3m)
 - e) In a centre - tapped full-wave rectifier, two diodes with $R_f = 10\Omega$, $R_r = \infty$, $V_\gamma = 0$ are used. The load resistance $R_L = 1000\Omega$. Find a) peak dc and rms load currents b) dc output voltage and dc power if a 24 volts peak sinusoidal signal is applied. (3m)
-
2. a) Draw the space charge, electric field and electrostatic potential as a function of distance across an open circuited PN junction and explain the nature of these curves. Explain the significance of potential barrier across the junction. (8m)

- b) A silicon diode operates at a forward voltage of 0.35V. calculate the factor by which the current will be multiplied when the temperature is increased from 20⁰ to 140⁰ C. (7m)
3. a) Draw the V-I characteristics of Zener diode and explain its operation. (7m)
- b) Draw the equivalent circuit of a tunnel diode and explain its operation. List out the applications of tunnel diode. (8m)
4. a) What are the factors which cause in shift of operating point in a transistor circuit. Explain thermal runaway. (5m)
- b) Design a self bias (emitter bias) circuit for a silicon transistor having $\beta = 60$, $V_{BE} = 0.6V$ with operating point (5V, 1mA). Assume $R_L = 3.3K$, $S \leq 10$ and $V_{CC} = 10V$. (5m)
- c) What are the regions of operation of a Transistor? Explain. (5m)
5. a) Define the h-parameters of a transistor and derive the expressions for A_i , A_v , R_i and R_o for CE transistor amplifier using h-parameters. (8m)
- b) A single stage CE amplifier having, $h_{ie} = 1500\Omega$ $h_{fe} = 50$, $h_{re} = 2.5 \times 10^{-4}$ and $h_{oe} = 25\mu$ mhos. Calculate A_i , A_v , R_i , R_o , A_{IS} and A_{VS} when $R_S = 1K\Omega$ and $R_L = 2K\Omega$. (7m)
6. a) Discuss the influence of coupling capacitance C_c on the low frequency response of RC coupled amplifier. (5m)

- b) Draw the hybrid-II model of BJT in CE connection and derive the equation for short circuit current gain. (5m)
- c) A BJT has $h_{ie} = 5 K\Omega$ $h_{fe} = 150$ at $I_C = 1mA$ with $f_T = MHz$ and $C_{b'c} = 12PF$. Determine i) g_m , $r_{b'e}$, $r_{bb'}$ and $C_{b'e}$ at room temperature and a collector current of 1mA. (5m)
7. a) Explain the operation of depletion mode MOSFET and enhancement type MOSFET with the help of neat sketches. (5m)
- b) A FET has a driven current of 4mA. If $I_{DSS} = 8mA$ and $V_{GS(off)} = -6V$. Find the values of V_{GS} and V_P . (5m)
- c) Explain how a FET is used as a voltage variable resistor. (5m)
8. a) Explain the operation of full wave rectifier with necessary circuit and waveforms. Derive the expressions for I_{DC} , V_{DC} , I_{rms} , dc output power and efficiency of the same rectifier. (10m)
- b) A full-wave rectifier has a centre-tap transformer of 100-0-100V and each one of the diodes is rated at $I_{max} = 400ma$ and $I_{av} = 150mA$. Neglecting the voltage drop across the diodes, determine i) the value of load resistor that gives the largest d.c power output, ii) d.c load voltage and current and iii) PIV of each diode. (5m)

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