4E1319

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Electrical & Electronics Engineering

4EX2-01 Biology

EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Why the venous blood is brighter in tropics as compared to temperate? Explain this observation as described by Julius Mayer.

Q.2 Aircraft tails are inspired by different types of bird tails. Justify.

Q.3 What is uricotelism? Give example.

Q.4 Name the three major kingdoms of life.

Q.5 Give the statement of the second law of Mendel.

Q.6 Define Epistasis.

Q.7 Differentiate between nucleoside and nucleotide.

Q.8 How the phospholipids in cell membrane are helpful in cellular transport?

Q.9 The most exciting aspect of biology as an independent scientific discipline is the diversity of life. Explain in brief.

Q.10 Write the name of four model organisms for the study of biology coming from different groups as studied by you.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 How science and engineering are different? Support your answer by comparing eye and the camera.

Q.2 Any scientific enquiry is always supported by observation. Justify this statement with the help of the original observation of Robert Brown in relation to his Theory of Motion.

Q.3 Classification is the core of Biology, it incorporates all the branches of life sciences. Elaborate.

Q.4 Write short notes on -

(i) Gene mapping

(ii) Human genetics

Q.5 What are reducing sugars? Device a test to ascertain their presence in a given material.

Q.6 Glycogen is often called as animal starch, why? Explain its importance and give its structure.

Q.7 Discuss how biological observations of 18^{th} Century lead to major discoveries. Cite relevant examples.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 With the help of well labelled diagrams differentiate prokaryotic and eukaryotic cells.

Q.2 Hierarchy is not just for classifying organisms, there can be other classification also. Discuss.

Q.3 Discus the single gene disorders in human with the help of illustrative examples.

Q.4 Proteins are the building blocks of life. Elaborate the statement in reference to enzymes, hormones, immune cells and tissues.

Q.5 The Meselson-Stahl experiment proved that DNA undergoes semiconservative replication in E. coil. In the "dispersive" model of DNA replication, the parent DNA strands are cleaved into pieces of random size, then joined with pieces of newly replicated DNA to yield daughter duplexes Explain how the results of Meselson and Stahl's experiment ruled out such a model.

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Electrical & Electronics Engineering
4EX3-04 Electronic Measurement & Instrumentation
EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Explain the loading effect in measuring instruments.

Q.2 What is the essential difference between moving coil and moving iron instruments?

Q.3 List two sources of error in bridge measurements and explain precautions.

Q.4 Define ratio error in instrument transformers.

Q.5 Describe the role of a volt ratio box in potentiometer measurements.

Q.6 How is earth resistance typically measured?

Q.7 State one advantage of using Hay's bridge for inductance measurement.

Q.8 Define phase angle error in potential transformers.

Q.9 State Blondel's Theorem for an n-phase, p-wire system.

Q.10 What is the main application of an AC potentiometer?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the errors encountered in wattmeters and their compensation methods.

Q.2 Derive the expression for torque equation for a moving iron instrument and comment upon the nature of scale.

Q.3 Illustrate the construction and operation of a current transformer (CT).

Q.4 Compare the ammeter-voltmeter method and the Wheatstone bridge method for measuring medium resistances.

Q.5 Discuss the applications of De-Sauty's Bridge in capacitance measurement.

Q.6 Explain the standardization process of a Crompton potentiometer.

Q.7 Explain the procedure for calibrating a single-phase energy meter using phantom loading.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Show that the Wien's bridge will be balanced at frequency given by -

$$f = \frac{1}{2\pi\sqrt{R_1 R_2 C_1 C_2}}.$$

Q.2 (a) The meter constant of a 230 V, 10 A watt-hour meter is 1800 revolutions per kWh. The meter is tested at half load and rated voltage and unity power-factor. The meter is found to make 80 revolutions in 138 s. Determine the meter error at half load.

(b) The inductance of a 25A electrodynamic ammeter changes uniformly at the rate of 0.0035 μH/degree. The spring constant is 10^{-6} Nm/degree. Determine the angular deflection at full scale.

Q.3 Describe the various methods for measuring low resistances. Compare their advantages and disadvantages.

Q.4 Derive the expression for the ratio and phase angle errors in current transformers. Suggest methods to minimize these errors.

Q.5 Describe the construction and working principle of a three-phase induction type energy meter. Discuss its advantages over single-phase energy meters.

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Electrical & Electronics Engineering
4EX4-05 Electrical Machine-II
EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define the following in AC machine winding –

(a) Distribution Factor

(b) Coil Span

Q.2 How concentrated winding differ from distributed winding?

Q.3 What is the main difference between a pulsating and a revolving magnetic field?

Q.4 What happens if the phase sequence of a three phase supply is reversed in an Induction machine?

Q.5 What is the difference between a squirrel cage and a wound rotor Induction machine?

Q.6 What is slip in an Induction motor? How is it defined?

Q.7 What is the effect of increasing supply frequency on the speed of an Induction Motor?

Q.8 Why does a single phase Induction motor not self-start?

Q.9 Why does a synchronous motor need an external starting mechanism?

Q.10 What is the significance of the Power angle in synchronous machine operation?

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the concept of air-gap MMF distribution. Also discuss the differences between full pitch and short pitch winding.

Q.2 Define and explain how a three phase winding arrangement produces a revolving magnetic field?

Q.3 Define the torque-slip characteristics of an Induction motor? Discuss the starting methods of Induction motor briefly.

Q.4 What is self-excitation in an Induction generator? Explain the working principle and concept of Doubly-fed Induction machine.

Q.5 Explain the split phase starting methods and applications for single phase Induction motor.

Q.6 Explain the V-curves of a synchronous machine. Also discuss the conditions required for the synchronization of alternators.

Q.7 Explain the Two-Reaction Theory and how it is used in salient pole machines?

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Explain the construction and working principle of three phase Induction Motor. Also discuss the equivalent circuit of an Induction Motor.

Q.2 Explain the construction and working of a synchronous generator. Also derive EMF equation and equivalent circuit of synchronous generator.

Q.3 Explain the effect of spatial displacement of winding on magnetic field production. Explain when two pulsating magnetic fields are spatially shifted by 90 degree with the help of diagram.

Q.4 (a) Explain the importance of 3D visualization of winding arrangements in AC machine.

(b) Compare concentrated winding and distributed winding.

Q.5 Write short note on –

(a) Condition and procedure for parallel operation of alternators.

(b) Methods of Braking in Induction Motor.

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Electrical & Electronics Engineering
4EX4-06 Power Electronics
EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 What is power electronics?

Q.2 What is converter?

Q.3 What is the necessary conditions for turning-on of an SCR?

Q.4 How is the magnitude of breakdown voltage effected if a junction has highly doped?

Q.5 What is meant by n-pulse rectifiers?

Q.6 What are the modes of operation of thyristor?

Q.7 Define turn-on and turn-off times for SCR.

Q.8 Draw the symbol of SCR, DIAC, TRIAC.

Q.9 Give four applications of phase-controlled rectifiers.

Q.10 Write difference between converter and inverter.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Describe the principle operation of DC chopper. Also derive an expression for its average output voltage.

Q.2 Briefly explain MOSFET and its switching characteristics.

Q.3 What are line-commutated inverters? How do they operate? Explain the line-commutated and force-commutated inverters.

Q.4 Power flow from 1-phase source to load R can be controlled through the use of a thyristor. Discuss why this method of power flow control is called phase-controlled converter.

Q.5 Define latching and holding currents as applicable to an SCR? Show these currents on its static V-I characteristics.

Q.6 Briefly explain the voltage control techniques for inverters.

Q.7 R, L and C in SCR circuit meant for protecting against dv/dt and di/dt are 4Ω, 6μH and 6μF, respectively. If the supply voltage to the circuit is 300v, calculate permissible maximum values of dv/dt and di/dt.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Snubber circuit for an SCR should primarily consist of capacitor only. But in actual practice, why a resistor is used in series with the capacitor?

Q.2 A single-phase half-wave SCR circuit feeds power to a resistive load. Draw waveform for source voltage, load voltage, load current and voltage across the SCR for a given firing angle α. Obtain the average and RMS load voltages in terms of source voltage and firing angle.

Q.3 Describe the working of a single-phase half-bridge inverter. What is its main drawback? Explain how this drawback is overcome. Also, explain how output power in single-phase full-bridge inverter becomes four times the power handled by a single-phase half-bridge inverter. Also what is the purpose of connecting diodes in antiparallel with thyristors in inverter circuits? Explain how these diodes come into play.

Q.4 Write short notes on –

(i) Buck-boost converter

(ii) Flyback converter

(iii) PWM control of voltage source

Q.5 Define the following terms –

(i) Firing angle

(ii) Local hot spot formation

(iii) Protection of thyristor

DO NOT WRITE ANYTHING HERE

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025
Electrical & Electronics Engineering
4EX4-07 Signals & Systems
EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Discuss the term –

(i) Linearity

(ii) Causality

Q.2 Discuss State Transition Matrix & its role.

Q.3 What is LTI system?

Q.4 Find the energy of the signal $e^{-2t}u(t)$.

Q.5 What are the advantages of DFT in comparison of DTFT?

Q.6 Explain Sampling Theorem.

Q.7 Explain Signal Reconstruction.

Q.8 Discuss the term Aliasing.

Q.9 What is continuous time decaying exponential?

Q.10 State Parseval's theorem for continuous time periodic signal.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Explain the properties of Laplace transform in detail.

Q.2 Determine the Nyquist rate and Nyquist interval corresponding to each of following signals -

(i) $x(t) = 1 + \cos(2000\pi t) + \sin(400\pi t)$

(ii) $x(t) = \sin(4000\pi t)/\pi t$

(iii) $x(t) = \cos[(4000\pi t)/\pi t]^2$

(iv) $x(t) = \text{sinc}(50\pi t).\ \text{sinc}(100\pi t)$

Q.3 Find the Fourier series coefficients of following signals -

(i) $x(t) = 1 + \cos(2\pi t)$

(ii) $x(t) = \sin\left(10\pi t + \frac{\pi}{6}\right)$

Q.4 Determine the following system is linear or not.

$\frac{5\,dy(t)}{dt} + y(t) = 5x(t)$.

Q.5 Find the convolution of following signals -

$x(t) = e^{-2t}\,u(t);\ h(t) = u\,(t+2)$

Q.6 Find the 4 point DFT of sequence:

$x(n) = \sin\left(\frac{n\pi}{6}\right)$

Q.7 Determine the Laplace transform, pole and zero locations and associated ROC for following functions:

(i) $u(t)$

(ii) $\delta(t-t_0)$

(iii) $\cos(\omega_0 t + b)\,u(t)$

(iv) $\sin(\omega_0 t + b)e^{-\alpha t}\,u(t);\ a > 0$

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Find inverse z-transform of $\frac{1}{(Z-3)(Z-2)}$; where

(i) $|Z| < 2$

(ii) $2 \le |Z| < 3$

(iii) $|Z| > 3$

Q.2 A system has transfer function H(s) as given below -

$$H(s)= \frac{S^2+5S+9}{(S+1)(S^2-2S+10)}$$

Determine response h(t) assuming that - (i) System is causal

(ii) System is stable.

Q.3 Describe all the properties of DFT in detail.

Q.4 For a continuous time signal:

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}\right)t + 4\sin\left(\frac{5\pi t}{3}\right)$$

Determine fundamental frequency ω_0 and Fourier series coefficients a_K

such that $x(t)= \sum_{K=-\infty}^{\infty} a_K.e^{jk\omega_0 t}$

Q.5 Compute $y[n] = x[n] * h[n]$, where $x[n] = \alpha^n u[n]$, $h[n] = \alpha^{-n} u[-n]$;

$0 < \alpha < 1$.

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B. Tech. IV - Sem. (Main / Back) Exam., - 2025

Electrical & Electronics Engineering

4EX4-08 Digital Electronics

EE, EX

Time: 3 Hours **Maximum Marks: 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

[10×2=20]

(Answer should be given up to 25 words only)

All questions are compulsory

Q.1 Define positive logic and negative logic system.

Q.2 Write down the characteristics of Digital ICs.

Q.3 What is a half adder?

Q.4 What is meant by K-Map or Karnaugh Map?

Q.5 Differentiate between Latch and Flip-flop.

Q.6 What is synchronous counter?

Q.7 Mention the various types of A/D converters in the increasing order of speed of operation.

Q.8 What are the specification of A/D converters?

Q.9 Give the different types of RAM.

Q.10 What is a PLA? Describe its uses.

PART – B

[5×4=20]

(Analytical/Problem solving questions)

Attempt any five questions

Q.1 Using 2's complement arithmetic, Subtract (i) $(-64)_{10}$ from $(+32)_{10}$ and (ii) $(29.A)_{16}$ from $(4F.B)_{16}$.

Q.2 Compare & contrast the features of TTL & CMOS logic families.

Q.3 Minimize the following expression using k-map -

$$F = \sum m(1, 5.6, 7, 11, 12, 13, 15)$$

Q.4 Draw the logic diagram of BCD to Decimal decoder and explain its operations.

Q.5 Explain how a JK flip-flop can be converted into a D flip-flop.

Q.6 Describe the successive approximation method of analog to digital conversion.

Q.7 Describe the RAM organization.

PART – C

[3×10=30]

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any three questions

Q.1 Implement the original and minimized expression for the function using Boolean algebra.

$$f = \overline{A}\,\overline{B}C + B\overline{C} + \overline{A}BC + ABC$$

Q.2 Simplify the following using the Quine-McClusky method -

$$F(w, x, y, x) = \sum m(1, 3, 7, 11, 15) + d(0, 2, 5)$$

Q.3 Draw the logic diagram of an asynchronous up-down counter and explain in details.

Q.4 Draw neat diagram for 4 bit R-2R ladder and weighted resistor types D/A convertors and compare them.

Q.5 Give the classification of semiconductor memories. Write short note on types of ROMs.
