

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Common**

Subject: **Engineering Materials (GC205)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Differentiate between Metals and Non-Metals.
- List down the properties and uses of high speed steel.
- Write a note on semiconductor materials.
- Explain the composition and properties of Bricks.
- Classify magnetic materials giving two examples of each type.
- Write a note on lead and its hazards to environment.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- State and define any three mechanical properties and any three physical properties of engineering materials.
- Explain any two types of cast iron along with its properties and applications.
- List down various constituents of aluminium alloys.
Explain effect of these constituents on properties of metal.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Write a short note on properties and uses of stainless steel.
- State various desirable properties of refractory materials.
- List down common varieties of timber. Also state any four uses of timber.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Write a note on classification of rocks.
- What are insulating materials? State the characteristics and application of any two solid insulating materials.
- What are high conductivity materials? State properties and applications of any two high conductivity materials.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Give specification of Silicon and Germanium as semiconductor material along with their uses.
- What are different constituents of paints? Explain any three constituents in detail.
- Write a note on function of lubricants.

Q.No.6. Write short note any three:

3 x 4 = 12

- Magnetic properties of engineering materials
- Types of reinforcement materials and their applications
- Properties and uses to soda glass
- Classification materials as conductor, semiconductor and insulating materials

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI/E&EE**

Subject: **Circuits & Networks (CC303)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Compute the equivalent capacitance between terminals A and B of the circuit in fig.1.
- Define the following network elements: i)Passive ii)Linear iii)Lumped
- Determine the effective resistance between terminals x and y in fig.2.
- State Kirchhoff's voltage law. Using KVL compute V in the circuit fig.3.
- A 50Hz voltage of 230V effective value is applied to a capacitor of 20F. Write the time equation for the current.
- Define a 2 port symmetric network. Draw the circuits of a symmetric T and symmetric π network.
- Draw the frequency response for a high pass filter and a band pass filter.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- State voltage divider theorem and current divider theorem. Using current divider theorem compute I_1 and I_2 in the circuit fig.4.
- Using nodal analysis find current in the 10Ω resistor in the circuit shown in fig.5.
- Compute the current through 2Ω resistor in the circuit fig.6. using the concept of mesh analysis.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- State Thevenin's theorem. Determine the current through 10Ω resistor. (refer fig.7.) using Thevenin's theorem.
- Using superposition theorem, compute the power delivered to the 10Ω resistor in circuit given in fig.8.
- Determine the input resistance of the circuit in fig.9. between terminals A and B using delta to star transformation.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain in brief the response of R, L and C to ac signal.
- Derive an expression for resonant frequency of a series RLC circuit. Draw and explain the resonance curve for small value of R.
- A resistance of 20Ω , inductance of 0.2H and capacitance of $100\mu\text{F}$ are connected in series across a 220V, 50Hz supply. Compute the following:
 - Inductive and capacitive reactance
 - Impedance of the circuit
 - Current
 - Voltage across R, L and C

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Draw the circuit of an RC integrator along with the output waveforms for sine and square wave inputs. Write the expression for the output of the integrator.

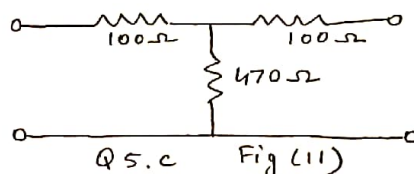
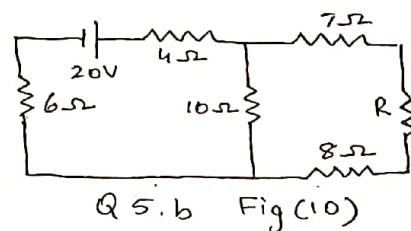
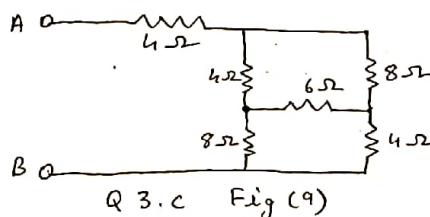
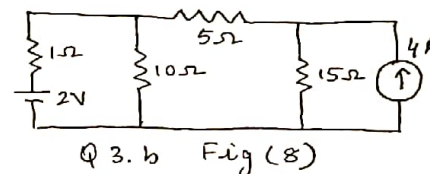
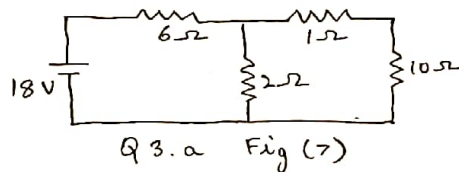
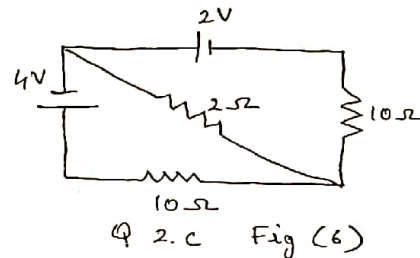
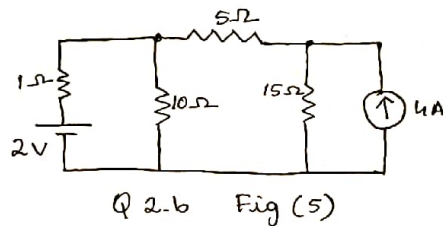
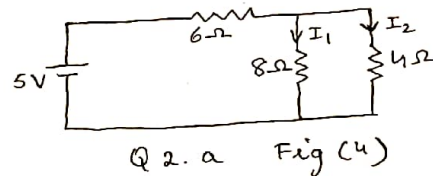
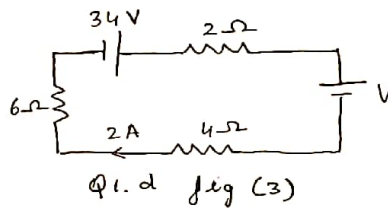
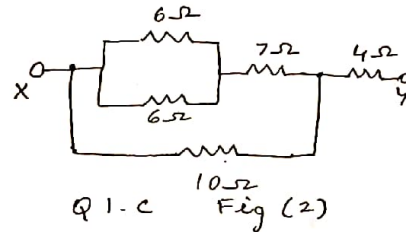
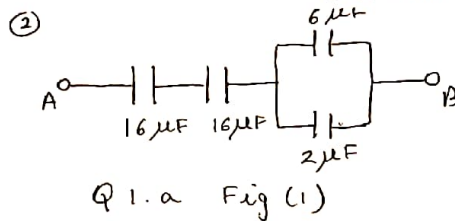
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- b) In the circuit fig.10. determine the value of R for maximum power transfer.
- c) Define the following for a two port network :
 i) Characteristic impedance ii) Open circuit impedance
 iii) Short circuit impedance
 Determine Z_0 and Z_{oc} for the network in fig.11.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- a) Derive an expression for the characteristics impedance of a symmetrical T network.
- b) Design a constant K low pass filter T types for terminal load resistance 500Ω and cutoff frequency 3KHz
- c) Design a constant K high pass filter having a cutoff frequency of 1KHz and a load resistance of 600Ω .



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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI/FT**

Subject: **Basic Electrical Engineering (CC304)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Draw sinusoidal A.C voltage waveform and label amplitude and time period.
- State the three types of losses in transformer.
- State three applications of D.C. shunt motor.
- State any three main parts of slip ring induction motor.
- State any three precautions against electric shock.
- Explain 'necessity of earthing' for an electrical system.
- Name any three main parts of D.C. motor.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Define real power, reactive power and apparent power in three-phase system.
- Distinguish between star and delta connections of three phase circuit. (any 6 points)
- Define average value, peak factor, and frequency of sinusoidal qualities.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- With neat diagram, explain the principle of operation of transformer.
- Define efficiency of transformer and write its equation. Also define voltage regulation and write its equation. State two applications of transformer.
- A 6000/600V, 20KVA single phase transformer has 100 turns on low voltage side. Neglect losses and calculate:
i) Rated full load current on high voltage side
ii) Rated full load current on low voltage side

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain working principle of D.C. motor, with neat circuit diagram.
- State different types of D.C motor, also draw their diagrams, and state one application of each.
- With neat circuit diagram, explain methods of reversal of direction of rotation of D.C series motor.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- With neat circuit diagram, explain the construction and working principle of universal motor.
- With a neat circuit diagram, explain the working of star-delta starter(manual), used in three phase induction motor.
- Explain method of reversal of direction of rotation of 3 phase induction motor. State any three applications of squirrel cage induction motor. Draw neat diagrams.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- With neat diagram, Explain 'Pipe Earthing'.
- With a neat diagram, explain the principle of operation of Miniature Circuit Breaker. (M.C.B)
- Define minimum fusing current, breaking capacity, voltage rating and current rating of fuse.

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Basic Electronics Engineering (CC308)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- What is a semiconductor? Give two examples of a semiconductor and write one application of the same.
- Explain how a depletion region is formed in a PN junction.
- What is the function of a diode in a rectifier circuit? Define peak inverse voltage for a diode.
- Define any three important ratings of a zener diode.
- Define the following for a transistor:
i) Emitter injection ratio ii) Base transportation factor
- Compare common emitter and common base configurations. (any 3 parameters)
- Define the following parameters of a JFET:
i) Dynamic drain resistance ii) Mutual conductance
iii) Amplification factor

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Explain the difference in conductors, insulators, semiconductors using energy band diagrams. Explain the terms intrinsic and extrinsic semiconductors.
- Explain doping of a semiconductor and the purpose of doping. Draw the structure of an N type semiconductor.
- Draw a neat diagram of a PN junction under forward bias conditions. Explain what happens under this condition.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Draw and explain the V-I characteristics of a PN junction diode. Explain cut-in or knee voltage and breakdown voltage.
- Draw the circuit of a centre tap full wave rectifier and explain its working. Draw the input and output waveforms.
- Define the terms ripple factor and rectification efficiency. Explain how the filter smoothes out the ac variations in the rectified voltage. Draw waveforms for the same.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain the need for voltage regulation. Draw the circuit of a voltage regulator and explain how the circuit produces a regulated output.
- Draw the V-I characteristics of a zener diode. Explain zener breakdown and avalanche breakdown.
- Explain why CE configuration is widely used in amplifier circuits. Draw the circuit of an NPN transistor in CE configuration.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Define the DC current gain of a transistor in CE and CB configuration. Determine the DC current gain of a transistor in CB configuration if the DC current gain in CE configuration is 100.
- Draw the schematic of an NPN transistor and explain the working of a transistor.

- c) Draw and explain the input characteristics of an NPN transistor in CB mode.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- a) Draw a schematic of an N-channel JFET and explain its working.
- b) With a neat diagram explain the operation of an N-channel enhancement type MOSFET.
- c) Compare BJT and JFET. (any 4 points)

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI/COMP/E/E&EE**

Subject: **Digital Electronics (CC309)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- a) Define analog signal and digital signal.
- b) What do you mean by BCD code? Give example.
- c) Draw symbol and truth table of EX-OR gate and NOR gate.
- d) Draw a block diagram of 4 bit parallel Adder.
- e) What is the significance of preset and clear I/PS of flip flop?
- f) What are the types of shift registers?
- g) Define ADC and DAC. List few applications of each.
- h) Draw symbol and truth table of T flip flop.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- a) Convert the following:
i) $(11011)_2 = ()_{10}$ ii) $(56)_{10} = ()_2$ iii) $(ABCD)_H = ()_2$
- b) Add the following numbers by 2's complement method:
i) $(+20)_{10}$ and $(-10)_{10}$ ii) $(-20)_{10}$ and $(-10)_{10}$
- c) i) What do you mean by 1's complement and 2's complement of a number? Give example.
ii) Convert $(1100)_2$ into its equivalent Gray code.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain NAND as universal gate.
- b) Using K-map minimize the following:
 $Y(A, B, C, D) = \sum(1, 3, 5, 7, 9, 11, 13, 15)$
- c) Explain De Morgan's theorems.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain full adder circuit with truth table and diagram.
- b) Explain working of synchronous 4 bit Up counter with timing diagram.
- c) Explain working of Mod-10 counter with timing diagram.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- a) Draw symbol, truth table of clocked Rs flip flop and explain it with timing diagram.
- b) Explain JK flip flop with symbol and truth table and also draw timing diagram.
- c) Explain serial in serial out shift register with timing diagram.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain asynchronous 4 bit up counter and draw timing diagram.
- b) Explain working of successive approximation register ADC.
- c) Explain R-2R ladder DAC.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Communication Engineering (EX301)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- List different frequency bands used in radio communication.
- Define S/N ratio.
- State the formula for modulation index in AM. What is its typical range of values?
- Define FM and draw its waveform.
- Define selectivity of a receiver.
- What is antenna resistance and beamwidth of an antenna?
- What is meant by polarization of an antenna?

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Write short note on industrial noise and extraterrestrial noise.
- Define PAM and PWM. Draw the waveforms.
- Explain operation of ISB with a suitable block diagram.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Describe working of a low-level AM transmitter with a block diagram.
- Explain the filter method of SSB suppression.
- Explain working of a diode detector circuit.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Write short note on pre-emphasis and de-emphasis.
- Describe working of a balanced slope detector circuit.
- List the advantages of AM over FM.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- With a block diagram, explain operation of a super heterodyne receiver.
- Describe working of a stereo FM multiplex transmitter.
- Write a short note on ground wave propagation.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- Explain the construction and working of a parabolic reflector with horn feed antenna.
- Describe how sky wave propagation takes place.
- Define virtual height and maximum usable frequency.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Electronic Circuits (EX401)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Explain in brief necessity of multistage amplifiers.
- State the difference between RC coupled and transformer coupled methods.
- Draw block diagrams of voltage shunt and current series feedback.
- List types of feedback in amplifiers and limitations of negative feedback.
- A negative feedback of $\beta=0.002$ is applied to an amplifier of gain 500. Calculate the gain with feedback.
- Draw circuit diagram of Bistable multi-vibrator and state its application.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Draw fixed bias circuit and explain the steps for selection of Q point.
- Draw single stage transistor CE amplifier and explain its working.
- Calculate Q-point for the voltage divider biasing circuit with following details: $V_{cc}=12V$, $R_c=5.6K\Omega$, $R_e=1K\Omega$, $R_1=90K\Omega$, $R_2=10K\Omega$, $\beta=75$

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Draw diagram of single stage CE amplifier. Compare feedback with and without bypass capacitor.
- Derive expression for voltage gain of a voltage series feedback amplifier.
- Explain the effect of negative feedback on output impedance of a voltage series amplifier.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain the operation of class 'A' power amplifier.
- Explain working of complimentary symmetry power amplifier.
- Explain the need for power amplifiers and differentiate between power and voltage amplifier.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Draw a circuit diagram of Colpitts oscillator and explain its working.
- With the help of a circuit diagram explain the working of Wein Bridge oscillator.
- Draw a phase shift oscillator with 3 RC sections. Calculate the frequency of oscillations if $R=400K\Omega$ and $C=0.01\mu F$

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- With the help of a diagram explain working of Astable multi-vibrator.
- Draw Schmitt trigger circuit and explain its working.
- Explain the working of direct coupled amplifier and list its applications.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Power Electronics (EX402)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: **5 x 3 = 15**

- a) Draw the symbol and labelled characteristics of UJT.
- b) Write the three advantages of using the freewheeling diode.
- c) What is a chopper? Draw the circuit of single thyristor chopper.
- d) Draw the block diagram of SMPS.
- e) What is a cycloconverter? Explain in brief types of cycloconverters.
- f) What is the function of Buck regulator? Draw the circuit of Buck regulator.

Q.No.2. Answer any two of the following Questions: **2 x 6 = 12**

- a) Draw and explain the two transistor model of SCR.
- b) Explain the pulse triggering of SCR using UJT with circuit diagram and waveforms.
- c) Explain class C type commutation of SCR.

Q.No.3. Answer any two of the following Questions: **2 x 6 = 12**

- a) Draw the labelled characteristics and symbol of:
i) DIAC ii) TRIAC
- b) Write short note on: i) Snubber circuit ii) LASCR
- c) Explain the working of Boost regulator with neat circuit diagram and waveforms.

Q.No.4. Answer any two of the following Questions: **2 x 6 = 12**

- a) Explain the working of full wave controlled rectifier with R load. Draw the circuit diagram and input, output voltage waveforms.
- b) Explain the working of half wave controlled rectifier with RL load. Draw the circuit diagram and input, output voltage waveforms.
- c) Explain the working of three phase half wave controlled rectifier with R load. Draw the circuit diagram and input, output voltage waveforms.

Q.No.5. Answer any two of the following Questions: **2 x 6 = 12**

- a) Explain the working of on-line UPS with the help of a block diagram.
- b) Explain with neat circuit diagram and waveforms operation of parallel inverter.
- c) Explain the working of full bridge inverter with R load with the help of circuit diagram and waveforms.

Q.No.6. Answer any two of the following Questions: **2 x 6 = 12**

- a) Explain the working of single phase to single phase $f/2$ Hz cycloconverter with neat circuit diagram and waveforms.
- b) Explain with neat circuit diagram and waveforms working of bidirectional AC voltage controller with R load.
- c) Explain the operation of $2f$ Hz cycloconverter with neat circuit diagram and waveforms.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **8051 Microcontroller(EX403)/ (EN501)[Rat/Rev]**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: 5 x 3 = 15

- List any three differences between microprocessors and microcontrollers.
- State the functions of EA and PSEN of 8051.
- What is the purpose of program counter in 8051?
- Differentiate between stack and stack pointer.
- What is the difference between 8051 counter and timer?
- If A=22H, R1=33H and R2=44H, state contents of register A after execution of ADD A, 02H instruction.
- Explain meaning of JB bit, RADDR instruction.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12

- Write a short note on 8051 oscillator and clock.
- List the format of PSW and explain the functions of different flags.
- Write a short note on 8051 ports and circuits.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12

- List down the different registers used in 8051 timers. Describe the different modes of 8051 timers.
- What is the function of SCON register? Explain meaning of the different bits of SCON register.
- Describe how priorities of interrupts are resolved in 8051.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12

- Give examples of any four arithmetic instructions and explain their meaning.
- Explain meaning of the following instructions with an example: i) XRL A, address ii) XCH A, @Rp iii) ORL C, bit
- With suitable examples, explain the different ROTATE instructions in 8051.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12

- How can an IR sensor be interfaced to the 8051?
- Describe the interfacing of a stepper motor to the 8051 microcontroller.
- Discuss how a server-segment LED display can be interfaced to the 8051.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12

- Two memory blocks of eight bytes each are stored in internal RAM locations starting from 60H and 80H. Write a program to exchange the bytes in these two memory blocks.
- Write a program to add the 'n' decimal numbers stored in internal RAM locations starting from 90H. Store the decimal result in registers R1 and R2.
- Write program to perform the following: i) Store the most significant nibble of register A in both nibbles of register R5
(ii) Complement the lower nibble of internal RAM location 2AH

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Linear Integrated Circuits (EX405)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Define the following parameters of an op-amp:
i) CMRR ii) Slew rate iii) Input impedance
- Draw the block diagram of a voltage shunt feedback amplifier. Write the expression for voltage gain.
- Draw the circuit diagram of an integrator using op-amp. Draw the output waveform for square wave input.
- Draw the circuit of Wein bridge oscillator using op-amp.
- List three applications of IC 566.
- Define the following terms:
i) Line regulation ii) Ripple rejection iii) Load regulation
- Draw a neat labelled circuit diagram of astable multivibrator using IC 555.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Draw the block diagram of an op-amp and explain the function of each block.
- i) List three characteristics of an ideal op-amp.
ii) Write three advantages of IC's over discrete components.
- Draw and explain the working of an op-amp as a subtractor.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Draw the circuit of voltage series feedback amplifier. Write the expression for voltage gain. Write the relation between R_1 and R_f if the voltage gain of amplifier is 11.
- i) Draw the symbol and equivalent circuit of an op-amp.
ii) Calculate the voltage gain for: 1) Voltage series feedback amplifier 2) Voltage shunt feedback amplifier, given $R_f = 10\text{ k}\Omega$ and $R_1 = 470\text{ }\Omega$
- What is the difference between clippers and clampers? Draw the circuit of non-inverting op-amp clamper with positive reference voltage. Draw the input and output waveforms.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Draw the circuit and explain the working of inverting op-amp as a summing amplifier with three inputs.
- Draw the circuit diagram and explain the working of positive clipper with positive reference. Draw the input and output waveforms.
- Draw the circuit diagram and explain the working of current to voltage convertor.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Draw the circuit diagram and explain the working of triangular waveform generator using op-amp. Draw the waveforms.
- Design a first order high pass butterworth filter having cutoff frequency of 1 kHz and passband gain of 2. Draw the circuit of filter.

- c) Draw the circuit diagram of a first order low pass butterworth filter. Draw the frequency response. List three advantages of active filters over passive filters.

Q.No.6. Write short note on any two:

2 x 6 = 12

- Block diagram of IC 555
- Salient features of IC 78XX series and IC 79XX series voltage regulators
- IC 555 as monostable multivibrator

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Electronic Measurements & Instrumentation (EX406)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Define the following dynamic characteristics: i) Lag ii) Speed of response iii) Fidelity
- Explain the function of the delay line in the vertical section of the CRO.
- With a neat diagram explain the construction of a liquid crystal display.
- List three characteristics of a transducer.
- Explain the construction and working of a phototransistor.
- Explain the measurement of linear displacement using a resistive transducer.
- List three applications of data acquisition system.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Explain the causes of systematic errors, and explain how these errors can be minimized.
- Draw the block diagram of digital multimeter and explain measurement of resistance, voltage and current.
- Draw and explain the block diagram of a digital storage oscilloscope.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Draw the block diagram of a function generator and explain the generation of square, triangular and sine waveforms.
- Draw and explain the block diagram of a basic spectrum analysis
- Draw the circuit of an AC bridge used for the measurement of inductance. Derive the expression to find the unknown inductance.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- With a neat diagram explain the construction and working of LVDT.
- With neat diagrams explain the working of capacitive transducer w.r.t varying distance between the plates and varying overlapping area of the plates.
- Explain the construction and working of a piezoelectric transducer with a neat diagram.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- With a neat diagram explain pressure measurement with strain gauge.
- Explain with a suitable diagram the measurement of flow of a fluid using turbine flow meter.
- Explain with a neat diagram angular speed measurement using magnetic pick-up.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- a) Draw and explain the block diagram of DC signal conditioning system.
- b) With a neat block diagram explain the operation of SCADA system.
- c) Draw the circuit of Wein bridge and derive the expression for unknown frequency.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Common**

Subject: **Industrial Organisation & Management (CC601)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

- Q.No.1. Answer any five of the following Questions:** **5 x 3 = 15**
- a) Explain individual proprietorship organisation.
 - b) What supervisory skills are required in the industry?
 - c) What are the various reasons for obsolescence?
 - d) What do you understand by conciliation?
 - e) Calculate the expected time (t_e) of an activity in PERT analysis, if (t_o) optimistic time is 10 days, pessimistic time (t_p) is 12 days and most likely time (t_m) is 11 days.
 - f) What is a group incentive plan?
- Q.No.2. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain functional organization with a neat sketch.
 - b) State the advantages and disadvantages of a partnership organization.
 - c) Explain the concept of management and administration.
- Q.No.3. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain the following functions of management:
i) Organizing ii) Coordinating
 - b) Write a note on store-keeping function in the industry.
 - c) Explain break-even analysis with the help of a neat sketch.
- Q.No.4. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain the various sources of finance.
 - b) Explain 'ABC Analysis' in materials management with a neat sketch.
 - c) i) What do you understand by depreciation?
ii) A machine was purchased for Rs.48,000. The life of the machine was estimated to be 12 years and the scrap value as Rs.12,000. Use the diminishing balance method to calculate the rate of depreciation.
- Q.No.5. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain the training function of personnel department.
 - b) Differentiate between time rate wage system and piece rate wage system.
 - c) Write a note on The Factories Act 1948.
- Q.No.6. Answer any two of the following Questions:** **2 x 6 = 12**
- a) What is a grievance? Explain briefly the steps involved in settlement of disputes of employees.
 - b) i) What do you mean by Just in Time system?
ii) Differentiate between CPM and PERT.

- c) The activity details and their predecessor are given below along with their activity times:

Activity	Predecessor	Activity Time (days)
A	-	5
B	A	8
C	B	6
D	A	5
E	D	4
F	C,E	6

Draw network diagram. Determine the critical path and project duration.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/EI**

Subject: **Programmable Logic Controllers (EX501)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- List any six advantages of PLC.
- Explain the general format of an I/O addressing in PLC.
- Sketch and explain the sourcing PLC input module.
- Describe any three conventions adopted in drawing a ladder diagram.
- Explain the data comparison instruction "LESS THAN" with the help of an example.
- Explain the mathematical instruction "ADD" with the help of an example.
- Draw and explain the ladder program to represent "NAND" logic function.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Explain in detail different types of PLCs.
- Draw block diagram and explain the working of AC input module of PLC.
- Draw and explain the working of general block diagram of a PLC.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- What are the basic rules of ladder programming?
- Draw and explain standard IEC 1131-3 symbols.
- Explain the concept of internal relays and battery backed relays.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain the following with reference to PLC timer: Time base, Present value, Accumulator, Total time delay
- What is the need of cascading timers? Explain cascaded timer with the help of an example.
- Draw and explain the function block of UP-counter.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Draw ladder diagram for the following Boolean expressions:
i) $Y_1 = X_1 \overline{X_2} X_3 + \overline{X_1} X_3 + X_2 \overline{X_3}$
ii) $Y_2 = (X_1 + \overline{X_2}) \cdot (\overline{X_1} + X_2 + \overline{X_3}) \cdot (X_2 + \overline{X_3})$
- Draw ladder diagram for the two motor system with following conditions: (Time base = 0.1sec)
i) Starting push button starts Motor 1
ii) After 25 seconds, Motor 2 is On
iii) Stop switch stops both Motor 1 and Motor 2
- Draw and explain working of ladder diagrams to control multiple outputs and sequenced outputs.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- a) Explain the steps involved in systematic design techniques of a system.
- b) Explain in brief following fault detection techniques
i) Replication ii) Last output set
- c) Explain in detail the steps involved in commissioning of a PLC system.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC**

Subject: **Autonomous Robots (EX612)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Define Autonomous Robot.
- Write three advantages of legged robot over wheeled robot.
- What is the function of serial.print (), analogwrite()?
- Draw the interfacing diagram of tilt sensor with Arduino.
- Draw transistor H-bridge circuit to control the direction of DC motor.
- What is a GPS? What are the communication pins of GPS module with Arduino?
- Give two points of difference between physical design and logical design of IOT.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- Explain the following sensor navigation components with the help of neat diagram: i) Bump Switch ii) Accelerometer
- Explain wired control and IR control components of Autonomous Robot with the help of neat diagram.
- Draw the block diagram of servomotor and explain the working.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Draw the block diagram of Arduino Uno development board and explain the working.
- Explain the following instructions with example and Arduino sketch: i) pinMode() ii) analogRead()
- Draw and explain interfacing diagram and Arduino sketch for motion detector PIR sensor.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Draw and explain interfacing diagram and Arduino sketch for light detector LDR sensor.
- Draw and explain interfacing diagram and Arduino sketch for distance measurement using ultrasonic sensor.
- Explain the following instruction with example and Arduino sketch: i) digitalWrite(3,0) ii) delay(1000)

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Draw interfacing diagram of servomotor with Arduino and write sketch to rotate it by, 0°, 45°, 90° and 180°.
- Draw interfacing diagram of DC motor with IC and Arduino and write sketch for movement of two wheeled robot to move forward and backward.
- Draw interfacing diagram of DC motor using transistor H-Bridge with Arduino and write sketch to control direction clockwise and anticlockwise.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- Explain any four characteristic of IOT.
- Draw and explain functional blocks of IOT.
- Draw and explain any one communication model of IOT.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg.**

Subject: **Digital Communication Techniques (EX601)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- State and explain the sampling theorem.
- Explain aperture effect in PAM.
- Explain companding in PCM.
- Draw neat waveforms (with reference to the message signal) to indicate natural sampling and flat top sampling.
- What is meant by local loop in a telephone exchange?
- Draw QPSK phasor diagram.
- List functions of an Electronic Exchange.

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- With a neat circuit diagram explain the generation of PAM.
- Define PPM. Explain the generation of PPM using IC 555.
- Explain demodulation of PWM with the help of neat waveforms.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- With the help of a neat diagram explain operation of a PCM receiver.
- What are the problems associated with delta modulation? Explain with suitable diagram.
- With a neat block diagram explain the operation of ADM transmitter.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- With a neat block diagram explain generation of QPSK.
- Explain coherent type FSK technique using a neat block diagram.
- With neat wave forms explain the 03 basic shift keying techniques used in digital communication.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Explain time division multiplexing with neat block diagram with respect to PAM systems.
- State any three advantages and three disadvantages of TDM over FDM.
- With a neat diagram explain the working of the sample and hold circuit using an op-amp.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- Classify the various switching systems in a telephone exchange system.
- With a suitable block diagram explain working of a centralized SPC system.
- Explain memory controlled time division space switching.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg.**

Subject: **Industrial Electronics (EX602)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate full marks.

3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions: 5 x 3 = 15

- a) Draw and explain smoke detector circuit.
- b) State the function of reset, trigger and discharge pin of IC555.
- c) Write the velocity and wavelength of ultrasonic waves in air, liquid and solid.
- d) Write a short note on brazing.
- e) Draw and explain graphical relationship between speed and torque of dc motor.
- f) Explain flow control valve in brief with diagram.

Q.No.2. Answer any two of the following Questions: 2 x 6 = 12

- a) Explain the working of temperature controller with circuit diagram.
- b) Draw the circuit of burglar alarm and explain it.
- c) Design astable multivibrator circuit using 555 timer to generate square wave of frequency 2KHz and duty cycle of 50% with neat diagram.

Q.No.3. Answer any two of the following Questions: 2 x 6 = 12

- a) Explain flaw detector using ultrasonic waves.
- b) With a neat diagram, explain piezoelectric generation of ultrasonic waves.
- c) Draw circuit of power flasher and explain it in detail.

Q.No.4. Answer any two of the following Questions: 2 x 6 = 12

- a) Distinguish between dielectric heating and induction heating.
- b) Explain the generation of dielectric heating with neat diagram.
- c) Comment on principle of induction heating. State its advantages and disadvantages and list its applications in brief.

Q.No.5. Answer any two of the following Questions: 2 x 6 = 12

- a) Explain the speed control and regulation of single phase AC series motor using SCR with neat diagram.
- b) With a neat diagram, explain the speed control and regulation of DC motor by Tachometer method.
- c) Draw the circuit for speed control of DC motor using full wave SCR and explain it.

Q.No.6. Answer any two of the following Questions: 2 x 6 = 12

- a) Explain working of pneumatic amplifier with neat diagram.
- b) What are synchros? Explain with diagram synchro transmitter and synchro receiver system.
- c) Explain basic principle of 4 position stepper motor with suitable diagram.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC**

Subject: **Data Communication (EX619)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

Q.No.1. Answer any five of the following Questions:

5 x 3 = 15

- Differentiate between point to point and multipoint networks.
- List the layers in the internet or TCP/IP model starting with the lowest mast layer.
- Define with suitable examples: i) Single bit error ii) Burst errors
- What is 'controlled access'? List any two popular controlled access methods.
- Enlist three features of bluetooth with reference to wireless LANs.
- Give the divisor $x^4 + x^2 + 1$, how many bits would have to be appended to the data to generate CRC?
- Differentiate between parallel and serial modes of data transmission. (03 points)

Q.No.2. Answer any two of the following Questions:

2 x 6 = 12

- With neat diagram explain the star and mesh topologies. State any two advantages of star topology over mesh.
- With relevant waveforms explain the concept of Quadrature Phase Shift Keying. (QPSK)
- Explain the five major components of a data communication system.

Q.No.3. Answer any two of the following Questions:

2 x 6 = 12

- Explain the functions of the application layer and the transport layer in the OSI model.
- With suitable diagrams explain synchronous and asynchronous transmission. Give at least one example where the above modes of transmission is used.
- Draw the format of the control field in the Information Frame (I-frame) in HDLC and explain each field.

Q.No.4. Answer any two of the following Questions:

2 x 6 = 12

- Explain the CRC technique for error detection with a suitable example.
- With an example show how hamming code can correct a single bit error.
- Explain the STOP and WAIT ARQ with neat diagrams.

Q.No.5. Answer any two of the following Questions:

2 x 6 = 12

- Explain how Selective Repeat ARQ mechanism works.
- Write a short note on Point to Point protocol.
- With a neat flowchart explain the CSMA/CD procedure with reference to multiple access protocols.

Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

- State any two features each of: i) Traditional ethernet ii) Fast ethernet iii) Gigabit ethernet
- Write a suitable diagrams explain how we can have networks with a Bus or Sstar as a backbone
- Write a short note on: (i) Virtual LANs ii) Data transparency in HDLC protocol

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

November, 2025 Examinations

Programme: **Electronics Engg./EC/E&EE**

Subject: **Consumer Electronics (EX624)**

Time Duration: **3 Hrs.**

Max. Marks: **75**

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable additional data if required.

- Q.No.1. Answer any five of the following Questions:** **5 x 3 = 15**
- a) Write applications of digital weighing machine.
 - b) Draw neat block diagram of digital thermometer.
 - c) What do you mean by fuzzy logic washing machine?
 - d) Write few technical specifications of digital camera.
 - e) Draw block diagram of public address system.
 - f) Write short note on fire prevention and fire fighting.
- Q.No.2. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Draw block diagram of digital calculator and explain it.
 - b) Explain working of digital weighing machine with neat block diagram.
 - c) Explain digital clock with neat block diagram.
- Q.No.3. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Draw microwave functional block diagram and explain it.
 - b) Explain brief about semiautomatic washing machine and fully automatic washing machine. What is the meaning of washing cycle?
 - c) Explain working of basic series voltage stabilizer.
- Q.No.4. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain about central AC and split AC.
 - b) Explain vapour compression refrigeration system.
 - c) Write few technical specifications of photocopier.
- Q.No.5. Answer any two of the following Questions:** **2 x 6 = 12**
- a) What do you mean by electronic surveillance system?
 - b) Explain about applications of metal detector?
 - c) Explain working of cordless phone.
- Q.No.6. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Draw block diagram of EPABX system and explain its working.
 - b) Explain the hazards associated with electric current and voltage. How to prevent these hazards?
 - c) What are the different components in the AC system?
 - d) Explain the working of PA system.
