

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Explain why a transformer rating is always in KVA instead of KW.
- Write the speed equation of DC motor and give the factors on which it depends.
- Define RMS value, form factors and frequency of sinusoidal AC waveform.
- Draw the torque and slip characteristic of 3 phase induction motor.
- List three precautions to be taken against shock.
- List any six applications of transformer.

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

2 x 6 = 12

- With a neat diagram, explain delta connected three phase system. Write relationship between line and phase voltages and current for delta connected system.
- Write a short note on balanced system and unbalanced system in a three phase system.
- Draw power triangle and define apparent power, reactive power and real power. Why is it said that reactive power does no useful work in the circuit?

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

2 x 6 = 12

- Explain hysteresis and eddy current losses in a transformer.
- Give six points of comparison between core type and shell type transformer.
- In a 50KVA transformer, the number of turns on the primary and secondary is 834 and 58 respectively. If primary is connected to a 3300V supply, find: i) Secondary voltage ii) The primary and secondary currents when the transformer is fully loaded. Neglect the losses

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

2 x 6 = 12

- Explain with neat diagram, field resistance speed control method for DC shunt motor.
- List the parts of DC motor and explain the function of any four parts.
- Explain in detail the methods of changing the direction of rotation of DC shunt motor with connection diagram.

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

2 x 6 = 12

- Explain the principle of operation of three phase induction motor.
- With a neat diagram, explain the working of autotransformer starter used for squirrel cage induction motor.
- Explain with a neat diagram working principle of permanent magnet type stepper motor.

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

2 x 6 = 12

- With a neat diagram explain pipe earthing.
- Explain principle of operation and application of current operation ELCB.
- With a neat diagram explain rewritable fuse.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Draw the energy band diagram for conductors, insulators and semi conductors.
- Draw the circuit of a half wave rectifier and draw the input and output waveforms for the same.
- Why are bridge rectifiers preferred over centre-tap full wave rectifiers?
- Draw the symbol of a zener diode. Explain in brief one application of a zener diode.
- Explain why CE configuration is widely used in amplifier circuits.
- Draw the input common emitter characteristics of an npn transistor.
- Draw a schematic of an n-channel JFET. Draw the symbol for the same.

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

2 x 6 = 12

- Draw the crystalline structure of an intrinsic semiconductor. Comment on the charge carriers in an intrinsic semiconductor.
- Draw the structure of an extrinsic semiconductor doped with a trivalent impurity. Name a trivalent impurity and explain the effect of doping with this impurity.
- With a neat diagram explain what happens when a pn junction is reverse biased.

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

2 x 6 = 12

- Define any two important ratings of a pn junction diode. Draw and explain the reverse characteristics of a pn junction diode.
- With a neat circuit diagram explain the working of a bridge rectifier. Define peak inverse voltage. Write the PIV for a bridge rectifier.
- What is the function of a filter in a power supply circuit? With a neat circuit diagram explain the working of a shunt capacitor filter.

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

2 x 6 = 12

- Draw the circuit of a voltage regulator. Explain how the circuit generates a regulated output under input voltage variation and load variation.
- A 5V stabilized power supply is required to be produced from a 12V DC power supply. The maximum power rating of the zener diode is 2W. Calculate the maximum current flowing through the zener diode. Draw the reverse characteristics of a zener diode.
- Draw the schematic of an npn transistor and explain the working of a transistor.

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

2 x 6 = 12

- a) Compare common emitter and common base configuration on the basis of the following parameters:
i) Input resistance ii) Output resistance iii) Current gain
iv) Leakage current
- b) Define alpha and beta of a transistor. Derive the relation between them.
- c) Draw and explain the output characteristics of an npn transistor in CE configuration.

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

2 x 6 = 12

- a) Compare JFET and MOSFET. (4 points)
- b) Draw and explain the drain characteristics of a JFET.
- c) Draw the structure and symbol of an n-channel depletion type MOSFET and explain its working.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Compare analog signal and digital signal.
- How gray codes are different from binary number, give example.
- State Boolean algebra laws.
- Draw circuit diagram of Half Adder and Half Subtractor.
- Explain in brief about race condition of JK flip flop.
- Draw symbol and truth table of T flip flop.
- What do you mean by EPROM and EEPROM?
- Draw symbol of JK flip flop and write its truth table.

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

2 x 6 = 12

- Convert the following:
i) $[1101\ 0110\ 0011]_2 = (\quad)_{16}$ ii) $[123]_{10} = (\quad)_{BCD}$
iii) $[1001]_{Gray} = (\quad)_2$
- Perform following binary addition:
i) $(+30)_{10}$ and $(-20)_{10}$ ii) $(-30)_{10}$ and $(-20)_{10}$
- i) Explain in brief about ASCII code.
ii) Convert $(1000)_2 = (\quad)_{Gray}$

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

2 x 6 = 12

- Explain NOR gate as universal gate.
- Solve the following by K-map:
 $X = B\bar{C}\bar{D} + \bar{A}B\bar{C}D + AB\bar{C}D + \bar{A}BCD + ABCD$
- Explain Demorgan's theorems.

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

2 x 6 = 12

- Explain the working of full subtractor with neat diagram and truth table.
- Explain working of synchronous 4 bit up counter. Draw timing diagram.
- Explain Mod-10 counter with timing diagram.

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

2 x 6 = 12

- Draw symbol, truth table of D flip flop and explain it.
- Explain operation of RS flipflop with its diagram and truth table.
- Explain SIPO shift register with timing diagram.

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

2 x 6 = 12

- Explain asynchronous 4 bit down counter with neat diagram. Also draw timing diagram.
- Explain R-2R binary ladder DAC.
- Explain operation of successive approximation register ADC.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Draw the block diagram of a communication system.
- Define noise figure.
- Draw waveforms of AM.
- State Carson's rule.
- Define sensitivity of a receiver.
- Define antenna gain.
- What is fading in ionospheric propagation?

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

2 x 6 = 12

- Write short note on atmospheric noise and shot noise.
- Define and draw waveforms of ASK and FSK.
- Draw and explain the frequency spectrum of AM. State the bandwidth of an AM wave.

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

2 x 6 = 12

- Explain high level AM transmitter with a block diagram.
- Explain working of a balanced modulator circuit.
- What is carrier power if total power in an AM wave is 2000W and modulation index is 0.6?

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

2 x 6 = 12

- Differentiate between narrowband FM and wideband FM.
- Explain working of varactor diode modulator circuit to generate FM.
- List the advantages of FM over AM.

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

2 x 6 = 12

- Draw and explain working of a TRF receiver. List the limitations of a TRF receiver.
- Explain the operation of an FM receiver with a block diagram.
- Describe working of a stereo FM multiplex receiver.

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

2 x 6 = 12

- Draw the Yagi-Uda antenna and describe its construction. Draw its radiation pattern.
- Write a short note on space-wave propagation.
- Define critical frequency and skip distance.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Define the following terms: Mesh ii) Node iii) Port
- Determine the equivalent capacitance between terminals A and B for the circuit in fig.1.
- Convert the star network shown in fig.2. to its equivalent delta network.
- A 60Hz voltage of 230V effective value is given to an inductance of 270mH. Write the time equation for the resulting current.
- Given $Z_{oc} = 800\Omega$ and $Z_{sc} = 600\Omega$, determine Z_1 and Z_2 for the symmetrical T network.
- Explain the function of a filter circuit. List any two applications of filters.
- Compute the equivalent inductance for $L_1 = 20\text{mH}$ and $L_2 = 40\text{mH}$ connected in: i) Series ii) Parallel

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

2 x 6 = 12

- State Kirchoff's voltage law and Kirchoff's current law. Using Kirchoff's current law find currents I_1 , I_2 and I_3 in fig.3.
- Using superposition theorem find current I_1 in the circuit of fig.4. State superposition theorem.
- Using Thevenin's theorem, calculate the current through the 4Ω resistance of the circuit shown in fig.5.

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

2 x 6 = 12

- Calculate the value of R in the circuit fig.6. which will absorb maximum power from the circuit. Also compute the value of maximum power.
- Using mesh analysis determine the current through 10Ω resistor in circuit shown in fig.7.
- Determine the current in the 2Ω resistor in circuit fig.8. using nodal analysis.

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

2 x 6 = 12

- Draw the circuit of an RC differentiator. Write the expression for the output and draw the output waveforms for sine and square wave inputs.
- Explain the concept of resonance in a series RLC circuit. With the help of a graphical representation explain variations of resistance, net reactance, circuit impedance and current with frequency.
- For a series RLC circuit, $R = 1\text{K}\Omega$, $L = 100\text{mH}$, $C = 10\text{pF}$ are connected across 100V ac supply. Compute resonant frequency, impedance and current at resonance, Q factor and half power frequencies.

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

2 x 6 = 12

- A 20Ω resistor is connected in series with an inductor and capacitor across an energy source. When the frequency is 400Hz the current is at its maximum value of 0.5A and the

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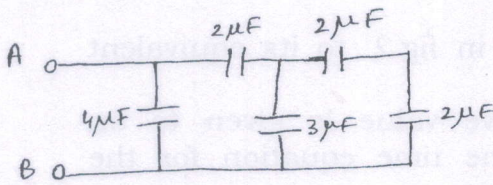
potential difference across the capacitor is 150V. Compute the value of inductance and capacitance.

- b) i) State the voltage divider theorem determine V_1 , V_2 , V_3 in circuit shown in fig.9.
 ii) Determine the current I in the circuit given two in fig.10.
 c) Define symmetrical two port network. Compute Z_o , Z_{sc} , Z_{oc} for the network in fig.11.

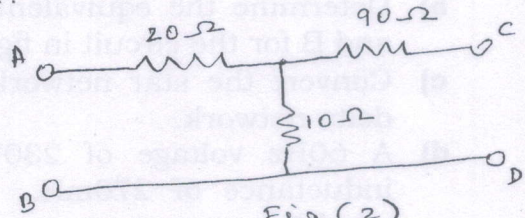
Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

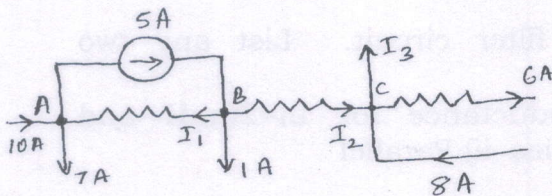
- a) Derive an expression for characteristic impedance of a symmetrical T network.
 b) Draw the frequency response for the following filters:
 i) LPF ii) HPF iii) BPF
 c) Design a constant K low pass filter T type with cut off frequency of 2KHz to operate with a terminal load resistance of 500Ω .



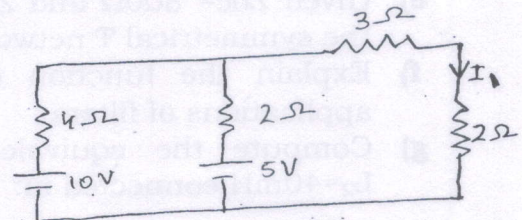
Q 1. b Fig (1)



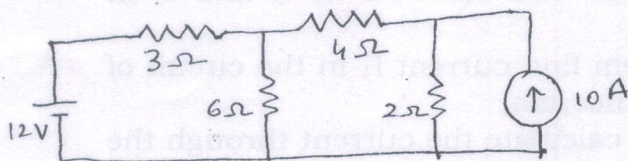
Q 1. c Fig (2)



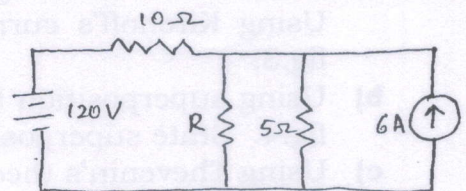
Q 2. a Fig (3)



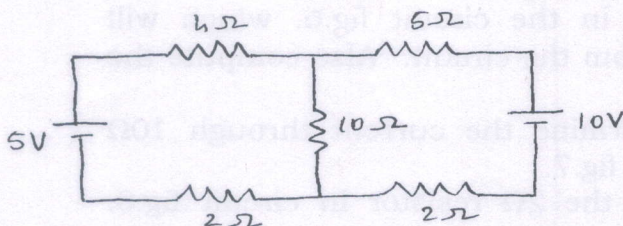
Q 2. b Fig (4)



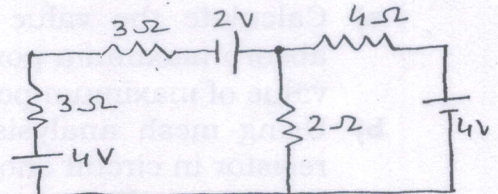
Q 2. c Fig (5)



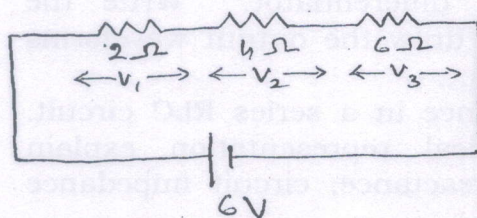
Q 3. a Fig (6)



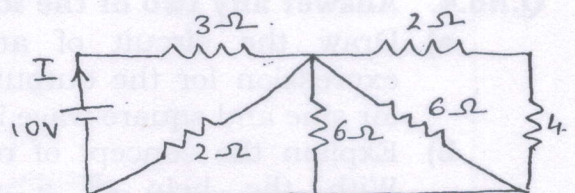
Q 3. b Fig (7)



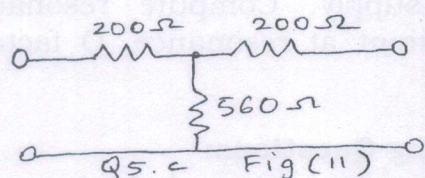
Q 3. c Fig (8)



Q 5. b(i) Fig (9)



Q 5. b(ii) Fig (10)



Q 5. c Fig (11)

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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 the need of a biasing circuit in an amplifier.
- Explain the steps involved for calculating the operating point in voltage divider bias circuit.
- List three merits of negative feedback.
- Draw the block diagram of voltage series and current shunt feedback amplifiers.
- List three points of difference between a power and voltage amplifier.
- Explain the piezoelectric effect a quartz crystal exhibits.
- List three applications of a multivibrator.
- Explain why voltage divider bias is preferred to fixed bias.
- Explain the function of the bypass capacitor in a single stage CE amplifier.

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

2 x 6 = 12

- Draw the circuit and explain the working of a transformer coupled amplifier.
- Draw a block diagram of a multistage amplifier. Explain the need for cascading amplifiers. List one advantage and disadvantage of transformer coupling over RC coupling.
- Determine the collector current and the collector-to-emitter voltage for a fixed bias circuit with $V_{CC}=9V$, $R_B=100K\Omega$, $R_C=1K\Omega$ and $\beta=60$.

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

2 x 6 = 12

- Draw the circuit of a voltage divider biasing circuit. Explain the function of the emitter resistor R_E . Obtain the expression for the Q point.
- Draw the circuit and explain the working of a direct coupled amplifier. List one advantage and disadvantage of this coupling method.
- With the help of a circuit diagram explain the working of a single stage CE amplifier feedback circuit with and without a bypass capacitor.

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

2 x 6 = 12

- Draw the circuit and explain the working of an emitter follower. List any two applications of this circuit.
- Derive an expression for the voltage gain and input impedance of a voltage series feedback amplifier.
- An amplifier has a gain of 1000 without feedback and cut off frequencies are $f_1=1KHz$ and $f_2=500KHz$ without feedback. If 1% of the output voltage of amplifier is applied as negative feedback, what are the new cutoff frequencies?

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

2 x 6 = 12

- Draw the circuit diagram and explain the working of a single ended power amplifier.

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- b) Explain with a circuit diagram the operation of a complementary symmetry push pull class B amplifier. Why class B operation is more efficient compared to class A operation?
- c) Explain the basic principle of RC oscillators. Draw and explain the circuit of an RC phase shift oscillator.

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

2 x 6 = 12

- a) i) Draw the circuit of Hartley oscillator using transistor.
ii) The tuned collector oscillator circuit makes use of an LC tuned circuit with $L_1=58.6 \mu\text{H}$ and $C_1=300\text{pF}$. Calculate the frequency of oscillation.
- b) Draw and explain the circuit of a bistable multivibrator. Explain how it is used as a flip flop to store 1 bit data.
- c) Draw the circuit and explain the working of a Schmitt trigger circuit. Draw the output waveform.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Electronics & Instrumentation Engg.**

Subject: **Process Instrumentation (EX408)**

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) State advantages and disadvantages of orifice plate.
- b) List the direct and indirect methods of level measurement.
- c) State Bernoulli's theorem.
- d) Draw the characteristics of thermister. State the temperature range.
- e) Explain the terms back lash and lost motion with reference to bourdon tube.
- f) Write a brief note on foundation field bus.

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

2 x 6 = 12

- a) Explain the working of an ultrasonic flow meter with the help of a neat diagram.
- b) Explain the working of rotameter with the help of a diagram.
- c) Explain the working of Coriolis flow meter with the help of a diagram.

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

2 x 6 = 12

- a) Explain the construction and working of thermocouple.
- b) Explain the working of liquid in glass thermometer with the help of a diagram.
- c) With a neat diagram explain the construction and working of radiation pyrometer.

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

2 x 6 = 12

- a) Explain the working of a U tube manometer with the help of a neat diagram.
- b) Explain the working of McLeod gauge with the help of a diagram.
- c) Explain the working of pressure sensor using strain gauge.

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

2 x 6 = 12

- a) Explain the working of a hook type level measurement system.
- b) Explain the working of a radiation type level detector with the help of a neat diagram.
- c) Explain ultrasonic method of level measurement.

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

2 x 6 = 12

- a) Explain the working of a pneumatic transmitter.
- b) With the help of a block diagram explain the working of a smart transmitter.
- c) Explain the working of a venturimeter with the help of a neat diagram.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA
April, 2026 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

- What do you understand by addressing modes? State the addressing modes for following:
i) MOV R₁ R₄ ii) MOV @ R₁, R₅
 - What is function of pin ALE?
 - Write the instruction to copy data from external RAM location 4500H to port 2.
 - What is an interrupt? Name interrupts available in 8051.
- Only for students of Rationalised scheme:**
- Write the instruction to multiply data bytes stored in internal RAM and store result in internal RAM. Assume suitable RAM locations.
 - Draw only block diagram of 8051 microcontroller.
- Only for students of Revised scheme:**
- Compare 8051 microcontroller with 8748.
 - Write any two points of comparison between microcontroller and microprocessor.

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

2 x 6 = 12

- Draw circuit diagram of port 1 and explain read, write operations.
- Explain concept of BANKs of on chip RAM. How will you select a particular bank?
- Write instructions to operate: i) Timer 1 in mode 1 ii) Timer 2 in mode 2

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

2 x 6 = 12

- What are different modes of serial transmission available in 8051? Explain any one of them.
- What is IP registered? Explain flag structure of register.
- Draw and describe flag structure of TMOD register.

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

2 x 6 = 12

- Write the output of each of following instructions:
MOV A; #57 H SWAP A ADDA, # 17 H DA A
- Explain the following instructions with example:
i) CPL A ii) ANL A, add iii) RRC A
- Explain any two arithmetic instructions with examples.

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

2 x 6 = 12

- Write a small assembly language programme to perform following:
i) Clear bit 3 of reg. R₁ of bank 0, without affecting other bits and display that data to port 1 ii) Exchange data between reg. R₃ and R₄ of bank 0
- Write a programme to invert the data from locations 20H to 25H of internal RAM and send to port 2 with some time delay.
- Write a programme to find how many times data FFH appears in internal RAM from 30H to 35H. Save the answer in accumulator.

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Only for students of Rationalised scheme:

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

2 x 6 = 12

- a) Answer the following:
 - i) Write the functions of pins RXD and EA.
 - ii) Write a programme to add data bytes stored at external RAM location 45H and 46H and store the result in internal RAM location 23H.
- b) Draw interfacing diagram of 8051 with stepper motor and write a program to operate it with full drive mode.
- c) Draw an interface diagram of switch and LED to suitable port pins. Write a programme to turn ON LED, when switch is pressed.

Only for students of Revised scheme:

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

2 x 6 = 12

- a) Answer the following:
 - i) Draw PSW and explain each flag.
 - ii) Explain different jump instructions with their ranges.
- b) What is stack? Explain with necessary instructions, operation of stack.
- c) Write a programme to find number of 1's in data stored at internal RAM location 38H. Save the answer at reg. R0 of bank 0.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Draw the symbol and equivalent circuit of an op-amp.
- Draw the circuit of voltage series feedback amplifier. Write the expression for voltage gain.
- Draw the circuit of positive clipper with negative reference. Draw the input and output waveforms.
- Draw the circuit of triangular wave generator using op-amp.
- Explain the following pins of IC 555:
i) Trigger ii) Reset iv) Discharge
- List three salient features of IC 78XX series voltage regulators.
- What is the value of capacitor required to obtain a pulse width of 10 milli-seconds, if the value of resistor used is 10Kilo-ohms in a monostable multivibrator using IC555?

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

2 x 6 = 12

- Define the following parameter of op-amps:
i) Input bias current ii) Bandwidth iii) Output impedance
iv) Output offset voltage
- What is an IC? List the IC classification. Write the advantages of IC's over discrete components.
- Draw the circuit diagram and explain the working of voltage to current converter with grounded load.

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

2 x 6 = 12

- Draw the block diagram and circuit diagram of a voltage shunt feedback amplifier. Write the expression for the voltage gain.
- i) List any three characteristics of ideal op-amp and their values.
ii) Explain the concept of negative feedback in an amplifier and its effect on voltage gain.
- Draw the circuit of differentiator using op-amp. Write the output voltage expression and draw the output waveforms for the following inputs: i) Sine wave ii) Square wave

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

2 x 6 = 12

- Draw the circuit diagram and explain the working of inverting op-amp as averaging amplifier with three inputs.
- Draw and explain the circuit of a non-inverting voltage comparator with positive reference. Draw the input and output waveforms.
- Draw the circuit diagram and explain the working of non-inverting op-amp clamper with positive reference. Draw the input and output waveforms.

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

2 x 6 = 12

- Explain the operation of Wein bridge oscillator using neat circuit diagram.
- With the help of circuit diagrams and waveforms explain the working of astable multivibrator using op-amp.

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- c) Design a 1st order low pass butterworth filter having cutoff frequency of 1KHz and passband gain of 2. Draw the circuit of the filter.

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

2 x 6 = 12

- Draw and explain the circuit of astable multivibrator using IC555. Draw the capacitor and output voltage waveforms.
- Draw and explain the block diagram of VCO IC566.
- Draw the circuit diagram and explain the working of LM317 voltage regulator.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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: i)Accuracy ii)Resolution iii)Error
- Explain with a suitable diagram the alternate mode in dual trace oscilloscope.
- Draw the circuit of Wheatstone's bridge and write the equation for bridge balance.
- List three points of difference between active and passive transducers.
- Explain the working of a capacitive transducer based on the variation of distance between the plates.
- Explain measurement of pressure using strain gauge.
- Explain the need for signal conditioning.

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

2 x 6 = 12

- Draw the construction and explain the working of permanent magnet moving coil mechanism.
- Draw the block diagram of an analog multimeter and explain how it works to measure resistance, DC current and AC voltage.
- Explain the construction and working of a cathode ray tube with a neat schematic diagram.

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

2 x 6 = 12

- Draw the block diagram of a cathode ray oscilloscope and explain its functioning.
- Draw the block diagram of a function generator and explain the generation of sine, square and triangular waveforms.
- With a neat diagram explain the construction and working of a liquid crystal display.

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

2 x 6 = 12

- Draw the block diagram of an instrumentation system and explain the function of each block.
- Explain the construction and working of bonded strain gauge with a neat diagram.
- With a neat diagram explain the construction and working of a shaft encoder.

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

2 x 6 = 12

- Explain with a neat diagram how linear displacement can be measured using an inductive transducer.
- Explain with a neat diagram angular speed measurement using photo electric pick up.
- With a neat diagram explain the measurement of water level using the float operated resistive method.

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

2 x 6 = 12

- Draw a neat block diagram of a data acquisition system and explain the function of each block.
- Draw and explain the block diagram of an AC signal conditioning system.
- Explain the working of a basic spectrum analyzer with the help of neat block diagram.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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 three advantages of PLC.
- State any three rules followed while drawing a ladder diagram.
- What is the difference between retentive and non-retentive timers?
- What is the significance of 'Timer Timing' AND 'Timer out' signals.
- Draw a ladder diagram to represent AND, OR and NOT logic functions.
- Describe an emergency stop relay functioning.
- What is 'last output set check' in fault finding.

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

2 x 6 = 12

- Explain sinking type input and sourcing type output in a PLC with relevant diagrams.
- With a neat diagram explain the working of AC input unit.
- With a neat diagram explain relay output unit.

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

2 x 6 = 12

- Draw IEC 1131-3 standard symbols for any three data comparison instructions. Explain them with an example for each.
- Draw the standard IEC 1131-3 symbols for shift right instruction. Explain its working with an example for 1 bit shift and 4 bit shift.
- What are internal relays? Explain their uses briefly.

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

2 x 6 = 12

- What is an ON delay timer? Explain its working with symbol and timing diagram.
- What is an up-counter? Explain its parameters.
- With a neat block diagram explain the working of a basic PLC system.

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

2 x 6 = 12

- Draw a ladder diagram to calculate the value of 'Y' in the equation: $Y = \frac{(0.5A + 2.0B)}{(0.5A - 3.0B)}$, where A, B and C are any three real numbers. Assume that these numbers are already stored in the memory of the PLC.
- In a process operation, Machine 1 starts as soon as the PLC starts. Machine 2 starts after 30 seconds of starting Machine 1. Machine 3 starts after 45 seconds of starting Machine 2. All the machines stop at 2 minutes and the entire process is repeated. Write a ladder program for controlling this process.
- In an auditorium, a sensor gives an input when a person enters through a door. After all 50 seats are occupied, the door is closed. The door opens automatically after 10 minutes or if an emergency button is pressed. Write a ladder diagram for controlling the door.

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

2 x 6 = 12

- a) Briefly explain the steps involved in commissioning a PLC based system.
- b) Describe the contents of a PLC based system document.
- c) What are subroutines? Explain any two instructions related to subroutines.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- List the advantages of partnership organization.
- Explain the packing and forwarding function in the industry.
- What do you understand by economic order quantity?
- Explain the term arbitration.
- Write down any three points of difference between PERT and CPM.
- Differentiate between incentive and wage.

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

2 x 6 = 12

- Write down the salient features of a public limited company.
- Explain line organization with the help of a sketch.
- Why management is called an art as well as science?

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

2 x 6 = 12

- Explain the following functions of management:
i) Forecasting ii) Controlling
- Write a note on marketing and sales promotion function in the industry.
- Explain ABC analysis in materials management with a neat sketch.

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

2 x 6 = 12

- Explain the elements of cost.
- Explain the importance of break-even chart with a neat sketch.
- A machine was purchased for Rs.91,000. The estimated life of machine is 14 years and scrap value is Rs.20,000. If the rate of interest is charged at 5%, calculate the rate of depreciation by sinking fund method. What will be depreciation amount after 3 years?

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

2 x 6 = 12

- Differentiate between selection and recruitment.
- Write the characteristics of a good incentive plan.
- Write a note on the Workmen Compensation Act 1923.

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

2 x 6 = 12

- Explain in brief grievance handling mechanism.
- i) Write a note on GST.
ii) Define the following terms with respect to network analysis: i) Critical path ii) Most likely time iii) Pessimistic time
- The activity details and their predecessor are given below along with their activity times:

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Activity	Predecessor	Activity time (days)
A	-	11
B	A	09
C	B	08
D	B	10
E	B	07
F	C, D, E	14

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

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Electronics & Instrumentation Engg.**

Subject: **Industrial Communication (EX637)**

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 protocol and list two types of data link protocols.
- b) Explain the mechanism of stop and wait flow control.
- c) Explain the function of repeater.
- d) List two user applications of MODBUS RTU.
- e) State advantages of HART.
- f) Compare RS 232 and RS 485.

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

- a) Describe the open system interconnection model of ISO.
- b) Explain the data link control protocol.
- c) Explain the media access protocol.

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

- a) Compare standard ETHERNET and ARCNET configuration.
- b) Explain the working and application of RS 485.
- c) Explain actuator sensor interface protocol.

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

- a) List and explain HART commands.
- b) Explain basic requirements of field bus standard.
- c) Explain OLE for process control.

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

- a) Explain the MODBUS protocol structure.
- b) Describe Profibus protocol stack communication model.
- c) Explain the features of foundation field bus.

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

- a) Describe the features of industrial ethernet.
- b) Explain the working of a radio MODEM.
- c) Explain the ISA 100 wireless protocol.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Electronics & Instrumentation Engg**

Subject: **Comp. Control in Process Plant (EX605)/(EN608) [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

- a) Explain the working of hierarchical control system.
- b) State an example of a signal generator, actuator and final control element.
- c) Explain the terms self regulation and dead time.
- d) How is SCADA different from HMI?
- e) State the advantages of distributed control system.
- f) When would you use PI controller mode?

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

2 x 6 = 12

- a) Explain the working of final control element with the help of an example.
- b) Explain the working and function of pneumatic actuator.
- c) Explain the working of a solenoid.

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

2 x 6 = 12

- a) Explain the working of two position controller mode.
- b) Explain the working of PID controller.
- c) Explain the working of ratio control.

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

2 x 6 = 12

- a) Describe the role of plant operator in DCS.
- b) Explain the working of rule based controller.
- c) Explain feed forward control with the help of a diagram.

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

2 x 6 = 12

- a) List the components of SCADA system and explain the function.
- b) Explain the star configuration used in SCADA with the help of a diagram.
- c) Describe the various special software facilities used in SCADA.

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

2 x 6 = 12

- a) Describe the architecture of DCS system.
- b) Explain thermal power plant automation with the help of block diagram.
- c) Explain the role of design and development engineer in DCS.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Electronics & Instrumentation Engg.**

Subject: **Building Automation (EX635)**

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 advantages of BMS.
- What is dew point? How does it relate to comfort in buildings?
- Draw a neat labeled block diagram of a DDC system.
- What is the function of a damper in a ventilation system?
- Define static pressure. Why is it important in the supply air control loop?
- Write short note on any one communication trunk used in BMS transmission.
- What is the difference between dry bulb and wet bulb temperature?

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

2 x 6 = 12

- Explain the concept of BMS. Discuss its components and various application areas.
- Differentiate between BMS and BCS. How do these systems contribute to energy efficiency and automation in smart buildings?
- Define communication protocols in BMS. Explain the working principles of peer communication protocol and poll/response protocol.

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

2 x 6 = 12

- Explain the working principle and characteristic of RTD.
- Define relative humidity. Explain the working principle of a capacitive type humidity sensor.
- Explain the construction and working of an anemometer.

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

2 x 6 = 12

- Explain Operating Software and Application Software used in BMS controller. Provide examples.
- What is energy management software? Explain its main features and role in improving energy efficiency.
- Classify different types of controllers used in BMS. Explain any two types in detail.

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

2 x 6 = 12

- Draw the block diagram of a chiller used in HVAC systems and explain its working.
- Explain the construction of electrostatic air filter and list its applications in HVAC systems.
- Explain the basic working of a heating and cooling system in HVAC.

Q.No.6. Answer the following Question:

- Draw P and ID diagram and explain the working for the following: (any 2) **2 x 6 = 12**
 - Humidity control loop
 - Pre heat coil temperature control loop
 - Cooling coil temperature control loop

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 Examinations

Programme: **Electronics & Instrumentation Engg.**

Subject: **Industrial Internet of Things (EX638)**

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 do you understand by inventory optimization in Industry 4.0?
- What is lean production?
- Name at least two network architecture, which are dedicated to networking IOT devices. Enlist at least two differences between them.
- Name main elements of one M2M architecture used to connect network of IOT devices.
- Name any one of the IOT module and describe its important features.
- Name two categories of data used in data analytics in network of IOT devices. Mention at least two examples each.
- How do you define 'smart city'? Explain the role of IOT technology in turning the city 'smart'.

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

2 x 6 = 12

- Enlist at least six sub components of Industry 4.0 and explain them in brief.
- Write a short note on the following benefits of one IOT in Industry 4.0:
i) Predictive maintenance ii) Inventory optimization
iii) Application of robotics
- Write a short note on industrial revolution along with benefits of Industry 4.0.

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

2 x 6 = 12

- What are the similarities between IOT networks and traditional IT networks?
- Draw a relevant diagram showing how sensors and actuators of IOT network interact with the physical world. Label the diagram neatly.
- Describe challenges of IOT network with reference to big data, legacy device support and security that strive for new network architecture.

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

2 x 6 = 12

- Is Raspberry Pi board suitable in IOT network? Explain your answer briefly.
- Explain designing flow monitoring system using Raspberry Pi and flow sensor.
- Enlist at least two cloud services available for IOT device connectivity. Also explain steps to configure cloud connectivity with an example.

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

2 x 6 = 12

- Enlist and explain at least two traditional big data analytics tools.
- Compare structured and unstructured data used in data analytics of IOT networks.

- c) Explain at least two of the following common security challenges faced by IOT industries:
i) Erosion of network architecture ii) Pervasive legacy systems
iii) Insecure operational protocols

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

2 x 6 = 12

- a) What is connected street lighting? Explain in brief along with its benefits.
b) Write a short note on architecture of 'smart parking' designed for smart city, with neat diagram labeled appropriately.
c) Write a short note on 'connected manufacturing' along with its business benefits to manufacturer.
