

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 dose 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

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

- a) Draw the crystalline structure of an intrinsic semiconductor. Comment on the charge carriers in an intrinsic semiconductor.
- b) 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.
- c) 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

- a) Define any two important ratings of a pn junction diode. Draw and explain the reverse characteristics of a pn junction diode.
- b) With a neat circuit diagram explain the working of a bridge rectifier. Define peak inverse voltage. Write the PIV for a bridge rectifier.
- c) 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

- a) Draw the circuit of a voltage regulator. Explain how the circuit generates a regulated output under input voltage variation and load variation.
- b) 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.
- c) 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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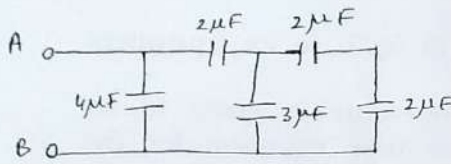
potential difference across the capacitor is 150V. Compute the value of inductance and capacitance.

- 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_0, Z_{sc}, Z_{oc} for the network in fig.11.

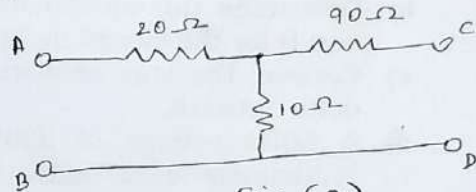
Q.No.6. Answer any two of the following Questions:

2 x 6 = 12

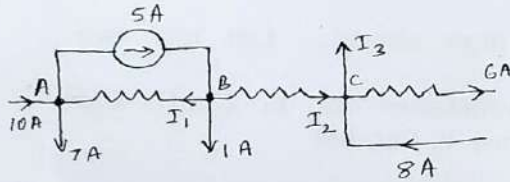
- a) Derive an expression for characteristic impedance of a symmetrical T network.
- b) Draw the frequency response for the following filters:
i)LPF ii) HPF iii) BPF
- c) Design a constant K low pass filter T type with cut off frequency of 2KHz to operate with a terminal load resistance of 500Ω .



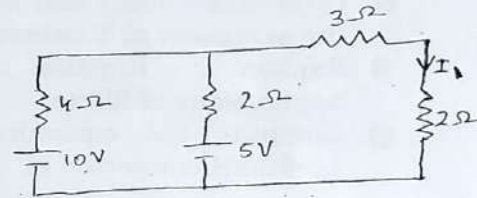
Q 1. b Fig (1)



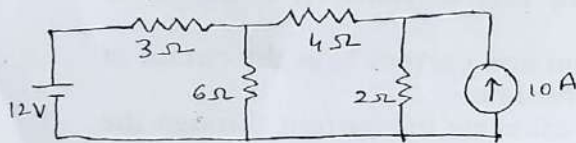
Q 1. c Fig (2)



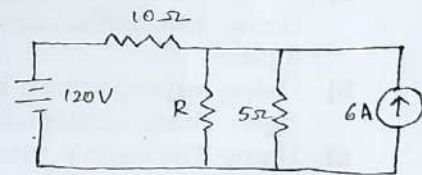
Q 2. a Fig (3)



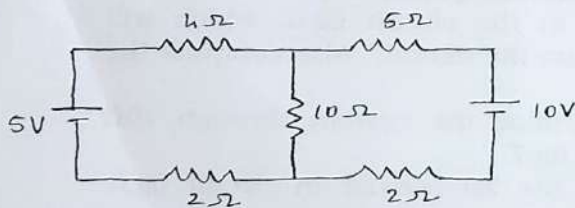
Q 2. b Fig (4)



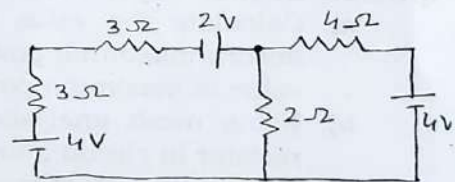
Q 2. c Fig (5)



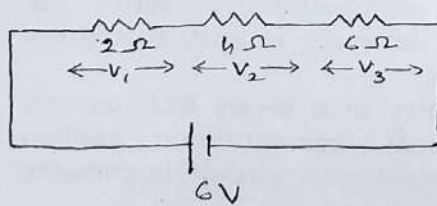
Q 3. a Fig (6)



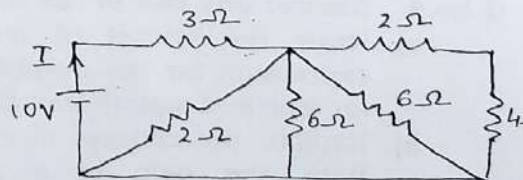
Q 3. b Fig (7)



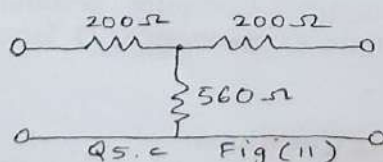
Q 3. c Fig (8)



Q 5. b (i) Fig (9)



Q 5. b (ii) Fig (10)



Q 5. c Fig (11)

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**

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

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

- a) Draw circuit diagram of port 1 and explain read, write operations.
- b) Explain concept of BANKs of on chip RAM. How will you select a particular bank?
- c) 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**

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

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

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

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

- a) 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
- b) Write a programme to invert the data from locations 20H to 25H of internal RAM and send to port 2 with some time delay.
- c) 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 interfering 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. Ro of bank 0.

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**

- a) Explain the need of a biasing circuit in an amplifier.
- b) Explain the steps involved for calculating the operating point in voltage divider bias circuit.
- c) List three merits of negative feedback.
- d) Draw the block diagram of voltage series and current shunt feedback amplifiers.
- e) List three points of difference between a power and voltage amplifier.
- f) Explain the piezoelectric effect a quartz crystal exhibits.
- g) List three applications of a multivibrator.
- h) Explain why voltage divider bias is preferred to fixed bias.
- i) 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**

- a) Draw the circuit and explain the working of a transformer coupled amplifier.
- b) 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.
- c) 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**

- a) 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.
- b) Draw the circuit and explain the working of a direct coupled amplifier. List one advantage and disadvantage of this coupling method.
- c) 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**

- a) Draw the circuit and explain the working of an emitter follower. List any two applications of this circuit.
- b) Derive an expression for the voltage gain and input impedance of a voltage series feedback amplifier.
- c) 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**

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

- 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 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**
- Draw the symbol and labelled characteristics of PUT.
 - What is the significance of free wheeling diode? For which operating load it is used?
 - What is a chopper? Draw the circuit of two thyristor chopper.
 - Draw the block diagram of on-line UPS.
 - What is a cycloconverter? List two applications.
 - What is the function of Boost regulator? Draw the circuit.
- Q.No.2. Answer any two of the following Questions:** **2 x 6 = 12**
- Draw and explain the V-I characteristics of SCR in forward biased mode.
 - Explain the pulse triggering of SCR using PUT with circuit diagram and waveforms.
 - What is meant by commutation in SCR? Explain class F type of communication.
- Q.No.3. Answer any two of the following Questions:** **2 x 6 = 12**
- Draw the symbol and labelled characteristics of: i)LASCR
ii)TRIAC
 - Write short note on: i) Snubber circuit ii)DIAC
 - Explain the working of Buck regulator with neat circuit diagram and waveforms.
- Q.No.4. Answer any two of the following Questions:** **2 x 6 = 12**
- Explain the working of half wave controlled rectifier with R load. Draw the circuit diagram and input, output voltage waveforms.
 - Explain the working of full wave controlled rectifier with RL load. Draw the circuit diagram and input, output voltage waveform.
 - 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**
- Explain the working of SMPS with the help of block diagram.
 - Explain with neat circuit diagram and waveforms, operation of series inverter.
 - Explain the working of off-line UPS with the help of a block diagram.
- Q.No.6. Answer any two of the following Questions:** **2 x 6 = 12**
- Explain the operation of $f/2$ Hz cycloconverter with neat circuit diagram and waveforms.
 - Explain with neat circuit diagram and waveforms, working of unidirectional AC voltage controller with R load.
 - Explain the working of on-off AC voltage controller with neat circuit diagram and waveforms.

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

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

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

2 x 6 = 12

- a) Define the following parameter of op-amps:
i) Input bias current ii) Bandwidth iii) Output impedance
iv) Output offset voltage
- b) What is an IC? List the IC classification. Write the advantages of IC's over discrete components.
- c) 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

- a) Draw the block diagram and circuit diagram of a voltage shunt feedback amplifier. Write the expression for the voltage gain.
- b) 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.
- c) 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

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

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

- 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

- a) Draw and explain the circuit of astable multivibrator using IC555. Draw the capacitor and output voltage waveforms.
- b) Draw and explain the block diagram of VCO IC566.
- c) 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:

- 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

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

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

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

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

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

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

- a) Explain the elements of cost.
- b) Explain the importance of break-even chart with a neat sketch.
- c) 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

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

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

- a) Explain in brief grievance handling mechanism.
- b) 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
- c) The activity details and their predecessor are given below along with their activity times:

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 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

- Write three applications of Autonomous Robots in brief.
- Explain in brief about three wheeled autonomous robots. How it is controlled and mention its application.
- What is the function of void setup() and void loop()?
- Draw the interfacing diagram of vibration detector piezo sensor with Arduino.
- Explain in brief how position of servomotor is controlled.
- Explain in brief about rotary encoder with the help of diagram.
- Define IOT, based on technology and infrastructure.

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)IR sensor ii)Ultrasonic range finder
- Explain wired control and radio control component of Autonomous Robot with the help of neat diagram.
- Draw the diagram and explain the working principle of DC motor.

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

- Draw the block diagram of Arduino Uno board and explain the working.
- Explain the following instructions with example and Arduino sketch: i)analogwrite() ii)digitalRead()
- Explain the following instructions with example and Arduino sketch: i)serial.begin(value) ii)serial.print(Data,Format)

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

- Draw and explain interfacing diagram and Arduino sketch for motion detector PIR sensor.
- Draw and explain interfacing diagram and Arduino sketch for temperature measurement using LM35.
- Draw and explain interfacing diagram and Arduino sketch for sound detector microphone.

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

- Draw interfacing diagram and Arduino sketch to control direction of DC motor using transistor H-bridge.
- Draw interfacing diagram of DC motor with IC and Arduino and write sketch for movement of two wheeled robot to move left and right.
- Draw interfacing diagram of servomotor with Arduino and write sketch to rotate it by 0°, 30°, 60°, 90°

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

- Explain any four characteristics of IOT.
- Draw the block diagram of logical design of IOT and explain each block.
- Explain any one communication modal of IOT with help of neat diagram.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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 circuit diagram of emergency light and state its function.
- b) Draw circuit diagram of cell phone jammer and state its function.
- c) What are the disadvantages of ultrasound welding?
- d) List applications of dielectric heating.
- e) Explain operating principles of DC motor.
- f) What are the basic objectives of process control?

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

2 x 6 = 12

- a) With the help of a neat circuit diagram explain the working of smoke detector.
- b) Draw a monostable multivibrator using IC555 timer and explain the design procedure for a specific value of pulse width.
- c) With the help of a neat circuit diagram explain the working of power flasher.

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

2 x 6 = 12

- a) Explain the basic principle of induction heating, state its advantages and disadvantages.
- b) Explain the basic principle of dielectric heating, state its advantages and disadvantages.
- c) With the help of a neat diagram explain induction heating application- Brazing.

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

2 x 6 = 12

- a) Explain speed control of single phase AC series motor using SCR. Draw neat diagram.
- b) Draw neat diagram and explain the speed control of DC motor using full wave SCR.
- c) With reference to DC shunt motor explain the following: torque, current, speed.

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

2 x 6 = 12

- a) Draw diagram and explain speed control of AC servo motor.
- b) Draw block diagram and explain concept of servomechanism.
- c) With the help of a neat diagram explain mechanical movement control using solenoid coil.

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

2 x 6 = 12

- a) Explain piezoelectric generation of ultrasonic waves.
- b) Explain the following application of ultrasonic waves: flaw detection.
- c) Draw and explain the working of battery charger circuit.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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) Compare electronic and mechanical weighing machine.
 - b) Draw neat block diagram of calculator.
 - c) Write three safety instructions for microwaves.
 - d) Give brief explanation and about UPC and AIAC bar codes.
 - e) Draw block diagram of EPABX system.
 - f) Write short note on hazards associated with electric current.
- Q.No.2. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Draw block diagram of digital thermometer and explain its operation.
 - b) Draw block diagram of digital clock and explain its working.
 - c) Explain working of digital weighing machine with neat block diagram.
- Q.No.3. Answer any two of the following Questions:** **2 x 6 = 12**
- a) What is the basic principle of microwave? What are the advantages of microwave over conventional electric heating system?
 - b) Explain washing machine hardware in detail.
 - c) Explain all water air conditioning system.
- Q.No.4. Answer any two of the following Questions:** **2 x 6 = 12**
- a) What is the need of voltage stabilizer? Write some technical specifications of it.
 - b) Explain vapour compression refrigeration system.
 - c) Explain operation of photocopier in detail.
- Q.No.5. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Write a brief note on barcode scanner and decoder.
 - b) Explain working of metal detector.
 - c) Explain working of public address system.
- Q.No.6. Answer any two of the following Questions:** **2 x 6 = 12**
- a) Explain transmitter and receiver section of cordless phone.
 - b) Write a short note on dangers of electricity and safety precautions.
 - c) Explain fuzzy logic washing machine.
 - d) Explain the working of applications of EPABX system.

BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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

- Explain QAM.
- Explain data transmission modes.
- Explain responsibilities of session layer in OSI Model.
- Explain TCP and UDP protocols.
- What is redundancy? Name any two error detection techniques.
- Explain with an illustration single bit error in Data Communication.
- What is HDLC? List types of frames of HDLC.
- List main features of bluetooth.
- List features of traditional ethernet.
- Explain CSMA w.r.t. multiple access protocols.

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

- What is topology? Explain QPSK with relevant diagrams. Also explain point to multipoint connection.
- Explain with relevant diagrams and state advantages of the following networks: i)Star topology ii)Ring topology
- What are standards? Explain any two standard organisations. Explain half duplex and full duplex with necessary diagrams.

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

- Explain the various protocols used in the network layer. Also state protocols used in the application layer.
- Explain data transmission modes used in Data Communication with suitable diagrams. Also differentiate between synchronous and asynchronous transmission.
- Explain checksum error detection technique using a suitable example.

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

- Explain Hamming code error correction technique with the help of a suitable example.
- Describe the frame formats of point-to-point protocol and describe each of the fields.
- Explain selective repeat ARQ, with necessary diagrams when a frame is lost.

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

- With a neat flow chart explain CSMA/CA procedure with respect to multiple access protocols.
- What is control access? Explain any one controlled access method in detail.
- Explain fast ethernet and gigabit ethernet.

Q.No.6. Answer the following Question:

- Write short note on any three: **3 x 4 = 12**
i)Star as backbone network ii) VLAN iii) CSMA iv)CRC error detection v)OSI model vi)HUBS viii)Repeaters viii)Bridges

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BOARD OF TECHNICAL EDUCATION

PORVORIM-GOA

April, 2026 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**
- Define PAM. Draw neat waveforms of single polarity PAM.
 - State and explain sampling theorem.
 - Explain companding in PCM.
 - Explain granular noise in DM.
 - Define FSK and draw its waveforms.
 - State advantages of FDM.
 - State various tasks performed in level 1 processing in distributed SPC.
- Q.No.2. Answer any two of the following Questions:** **2 x 6 = 12**
- With neat circuit diagram, explain the operation of sample and hold circuit.
 - With neat block diagram, explain demodulation of PAM signal.
 - Explain generation of PWM signal using indirect method.
- Q.No.3. Answer any two of the following Questions:** **2 x 6 = 12**
- Explain the operation of PCM receiver with neat block diagram.
 - With neat block diagram, explain the operation of DM transmitter.
 - Explain the working of ADM receiver with neat block diagram.
- Q.No.4. Answer any two of the following Questions:** **2 x 6 = 12**
- Define ASK. Explain generation technique.
 - Explain FSK detection technique with neat block diagram.
 - Explain BPSK generation method with neat block diagram.
- Q.No.5. Answer any two of the following Questions:** **2 x 6 = 12**
- Explain the operation of TDM system with neat block diagram.
 - Explain the working of various elements of a switching system with neat block diagram.
 - Explain the operation of memory controlled time division space switching system.
- Q.No.6. Write short note on any three:** **3 x 4 = 12**
- Load sharing mode of dual processor system
 - SPC concept in telephone exchange
 - Aliasing effect in PAM
 - PPM modulator circuit using IC555
