

Indian Maritime University
(A Central University, Govt of India)

End Semester Examinations – June 2026

Programme Name: B Sc (NS)

Semester: II

Subject Code: UG21T6202

Subject Name: Nautical Physics and Electronics

Date: 03.06.2026

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
- (ii) Options, if any, are specified in respective section.

Section A

Ten MCQs of 01 Mark each – Choose the correct answer as applicable.

Section A (10 x 1 Marks = 10 marks)

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Which factor mainly affects reverse saturation current?
(a) Temperature (b) Voltage (c) Resistance (d) Capacitance
2. If both sides of a p-n junction are heavily doped, the diode will
(a) Have high breakdown voltage (b) Have low breakdown voltage
(c) Not conduct (d) Become insulator
3. A rotating coil in a DC generator produces zero EMF at an instant. At that moment
(a) Coil plane is perpendicular to magnetic field
(b) Magnetic flux is maximum
(c) Coil plane is parallel to magnetic field
(d) Rate of change of flux is maximum
4. A DC series motor should never be run without load because
(a) Speed becomes dangerously high (b) Current becomes zero
(c) Torque becomes zero (d) Voltage drops
5. An inductor of self-inductance 2 H carries a current that changes from 0 A to 5 A in 0.1 s. Induced EMF _____
6. In a CE amplifier, the phase reversal occurs primarily because:
(a) Base-emitter junction is forward biased
(b) Output is taken at collector where voltage drop increases with current

- (c) Collector current increases with base current
 (d) Emitter is grounded
7. Why is Class C amplifier not used for audio?
 (a) Low gain (b) Low efficiency (c) High distortion (d) No output
8. The Boolean expression $A(A+B)$ is equal to
 (a) 1 (b) $A+B$ (c) B (d) A
9. The Barkhausen criterion is used to determine
 (a) Amplifier gain (b) Input impedance
 (c) Oscillation condition (d) Output power
10. The AC equivalent circuit helps in finding _____
 (a) Bias current (b) Voltage gain
 (c) Q-point (d) all

Section B

Answer all Questions.

(5 X 2 Marks = 10 Marks)

11. State the properties of semiconductors.
 12. What is back e.m.f in DC motor?
 13. State Lenz's law.
 14. Draw D.C. equivalent circuit of an amplifier.
 15. Define a universal gate. Why is it called so?

Section C

Answer any 05 questions out of 07 questions. (5X10 Marks = 50 Marks)

16. a) Draw and explain Volt-Ampere characteristics of pn junction. **(5 Marks)**
 b) Explain the working principle of a light dependent resistor. **(5 Marks)**
17. a) How does LED differ from an ordinary diode? List the advantages and applications of LED. **(4 Marks)**
 b) What is the thermoelectric effect? Mention its applications. **(3 Marks)**
 c) Determine the generated e.m.f of a DC generator running at 500 rpm. The generator has an 8-pole lap-wound armature with 1200 conductors and the flux per pole of 0.03 wb. **(3 Marks)**
18. a) Explain the principle of operation of AC generator. Illustrate your answer with neat sketch. **(7 Marks)**

- b) A coil of resistance $100\ \Omega$ is placed in a magnetic field of $1\ \text{mwb}$. The coil has 150 turns and a galvanometer of $500\ \Omega$ resistance is connected in series with it. Find the average e.m.f and the current if the coil is moved in $1/10^{\text{th}}$ second from the given field to a field of $0.4\ \text{mwb}$.
(3 Marks)
19. a) Describe self-inductance and mutual inductance with their coefficients.
(7 Marks)
- b) Two coils, A and B, have self-inductances of $120\ \mu\text{H}$ and $300\ \mu\text{H}$ respectively. A current of 1A through coil A produces flux linkages of $100\ \mu\text{wb}$ turns in coil B. Calculate the coupling coefficient. (3 Marks)
20. a) Calculate the input and output resistance of an amplifier for the following given conditions. A change of 100mV in base-emitter voltage causes a change of $50\ \mu\text{A}$ in the base current. The collector current changes from 1mA to 2mA when the collector emitter voltage is increased from 1V to 7V .
(3 Marks)
- b) Describe the principle of negative voltage feedback in an amplifier with neat sketch and derive the expression for its gain.
(7 Marks)
21. a) A single stage amplifier has a voltage gain of 100. The collector load R_C is $1\text{k}\Omega$ and the input impedance is $2\text{k}\Omega$. Calculate the overall gain when two such stages are cascaded through R-C coupling. (3 Marks)
- b) Classify power amplifiers according to their mode of operation and explain push pull circuit in detail.
(7 Marks)
22. a) Explain the action of Hartley oscillator with neat diagram. Mention its frequency of oscillation and feedback fraction.
(7 Marks)
- b) Find the complement of the following Boolean expression
 $Y = \bar{A}(B\bar{C} + \bar{B}C)$.
(3 Marks)

