Indian Ma4ritime University

(A Central University, Govt of India)

Sep/Oct'25 SE

Programme Name: B Sc (Nautical Sciences)

Semester: II

Subject Code: UG21T6202

Subject Name: Nautical Physics and Electronics

Date: 02.09.2025 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/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable. [10 X 1=10 marks]

1. The depletion region of a semiconductor diode is due to
   (a) Reverse biasing (b) Forward biasing (c) Both a & b (d) None
2. A pn junction that radiates energy as light instead of as heat is called a_____
   (a) LED (b) photo-diode (c) photocell (d) Zener diode
3. The commutator of a d.c. generator function as a rectifier (True/False)
4. What is the working principle of a 3-phase squirrel cage induction motor
   (a) Electromagnetism (b) Faraday's law of electromagnetic induction
   (c) Fleming right hand rule (d) Fleming left hand rule
5. A d.c. series motor is most suitable for_____
   (a) Cranes (b) Lathes (c) Punch Presses (d) Pump
6. The self-inductance of two coils are 4mH and 9mH respectively. if the co-efficient of coupling is 0.5, the mutual inductance between the coil is____
   6.5 mH (b) 18 mH (c) 3 mH (d) 12.5 mH
7. In transistor amplifiers, we generally use _____ capacitors.
   (a) Electrolytic (b) Mica (c) Air (d) Paper
8. If a three-stage amplifier has individual stage gains of 10 *db*, 5 *db* and 12 *db*, then total gain in *db* is_____
   (a) 600 *db* (b) 27 *db* (c) 14 *db* (d) 24 *db*
9. A CE amplifier can be converted into oscillator by
   (a) Providing adequate positive feedback.
   (b) Phase shifting the output by 180° and feeding this phase-shifted output to the input.
   (c) Using only a series tuned circuit as a load on the amplifier.

(d) Using a negative resistance device as a load on the amplifier.

10. Which logic gate is known as Universal gate

(a) AND (b) NOT (c) NAND (d) OR

Section B

Five Questions of 02 Marks each [5 X 2=10 marks]

11. Explain LDR operation and its applications?
12. Compare DC series and DC shunt motor?
13. Explain heating effect of current?
14. What do you understand by cascading stages of amplifier? Mention its need?
15. Define Barkhausen's criteria for oscillators.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered. [5 X 10=50 marks]

16. What is *pn* junction? Discuss the behaviour of a *pn* junction under forward and reverse biasing with V-I characteristics. [3+7]
17. (a) Define coefficient of coupling? Derive an expression for (i) self-Inductance (ii) Mutual Inductance and (iii) coefficient of coupling [5]

    (b) A flux of 0.5 mWb is produced by a coil of 900 turns wound on a ring with a current of 3 A in it. Calculate (i) the inductance of the coil (ii) the e.m.f. induced in the coil when a current of 5 A is switched off, assuming the current to fall to zero in 1*ms* and (iii) the mutual inductance between the coils, if a second coil of 600 turns is uniformly wound over the first coil. [3]
18. (a) Explain with a neat sketch, principle, construction and working of DC Generator? [7]

    (b) Derive EMF Equation of a DC Generator? A 4-pole, D.C. generator has a wave-wound armature with 792 conductors. The flux per pole is 0.0121 Wb. Determine the speed at which it should be run to generate 240 V on no-load. [3]
19. Explain principal of working of induction motor and its applications? [10]
20. (a) What do you understand by amplifier? Explain the working of common emitter (CE) amplifier? [5]

    (b) Draw and explain the d.c. and a.c. equivalent circuits of a transistor amplifier. [5]
21. Define (i) Frequency response (ii) Decibel gain? With a neat circuit diagram, explain class B Push-Pull amplifier. [3+7]
22. (a) Explain NAND gate with truth tables? Simplify the following Boolean expression: $AB\bar{C}+A\bar{B}\bar{C}+\bar{A}BC+ABC+A\bar{B}C$ [5]

    (b) Define an LC tank circuit? Explain the working of Hartley Oscillator with a neat circuit diagram. [5]