

**INDIAN MARITIME UNIVERSITY**  
**(A Central University, Government of India)**

B. Sc. (NAUTICAL SCIENCE) - Semester – II  
December 2017 End Semester Examinations

**Nautical Electronics**  
**Subject Code: UG21T3203**

Time: 3 Hours  
Date: 14.12.2017

Max Marks: 70  
Pass Marks: 35

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- Note: (i) Attempt any 7 questions. All questions carry equal marks.  
(ii) Draw neat sketches and label it properly.  
(iii) Use last page of answer sheet for rough calculations
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- Q. 1 (a) With respect to a PN junction diode, define the following— (2)  
1) Cut-in Voltage  
2) Peak Inverse Voltage  
(b) A single phase full wave bridge rectifier is supplied with 12 VAC power supply at 50 Hz. One of the diodes, which get forward biased during positive half cycle of input sine wave is internally open circuited. The load is in the form of a resistor  $R_L$ . Draw the rectifier circuit and indicate the faulty diode by labelling it as  $D_F$ . draw the output voltage and current waveforms. (5)  
(c) Describe how a Zener diode acts as voltage regulator with a neat sketch. (3)
- Q. 2 (a) Draw the typical output characteristics of a BJT in CE configuration and clearly show cut-off, liner and saturation regions their-in. Also show a typical maximum power dissipation curve on the same. (6)  
(b) Write the expression for DC load line for a CE amplifier without emitter resistor ( $R_E=0$ ) and calculate the values of  $I_{CQ}$  and  $V_{CEQ}$ , which lies at the centre of the load line. Given that supply voltage  $V_{CC} = 12$  V and  $R_C = 1K\Omega$ . (4)
- Q. 3 (a) Draw the circuit diagram of a NPN transistor based common emitter amplifier with voltage divider bias and describe the function of all the components clearly. (6)  
(b) A power transistor working in class A operation has zero signal power dissipation of 10W. If the a.c. power output is 4W, find (i) Collector Efficiency and (ii) Power rating of the transistor. (4)
- Q. 4 (a) Draw the circuit diagram of a BJT based Colpitt's oscillator and write the expression for its frequency. (4)  
(b) Draw the circuit diagram and explain the working of a IC 555 based astable multivibrator. (6)

- Q. 5 (a) Simplify expression using Booleans law  $Y = (A + B)(A + \overline{B})(\overline{A} + C)$  (1)
- (b) Simplify expression using De-Morgan's theorem  $\overline{(M + \overline{N})(\overline{M} + N)}$  (1)
- (c) What is full adder? Draw logic diagram of full adder using two half adder and write its truth table (3)
- (d) Draw and explain working of 4-bit Ripple Counter using negative edge triggered JK Flip-Flop with reference to output waveforms? (5)
- Q. 6 (a) What is Frequency Modulation? Draw the circuit diagram and explain working of FM Generation using Varactor diode modulator? (5)
- (b) A sinusoidal carrier of 1MHz/100 Volts is amplitude modulated by modulating signal of 5 KHz with 50% modulation. Find all frequency and amplitude components in transmitted AM wave. Find total power transmitted by this AM wave. Draw AM wave and mention all parameters? (5)
- Q. 7 (a) What is RADAR? Draw block schematic and explain working of components of RADAR system? What are the types and applications of RADAR for ship navigation? (5)
- (b) What is principle of super-heterodyne receiver? Draw block schematic and explain working of FM Radio receiver? Also explain working of FM slope detector? (5)
- Q. 8 Write short note on following
- (i) Domestic Satellite (5)
- (ii) RDF (5)
- Q. 9 (a) Prove that NAND and NOR gates are universal gates. (5)
- (b) Implement a 8:1 MUX using two 4:1 MUX and one 2:1 MUX ICs. (5)

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