

**INDIAN MARITIME UNIVERSITY**  
(A Central University, Govt. of India)  
End Semester Examinations- Dec 2019/Jan 2020  
**B.Tech (Marine Engineering)**  
**Semester-III**  
**UG11T1302/2302– Electronics**

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**Date: 12.12.2019**  
**Time: 3 Hrs.**

**Maximum Marks: 70**  
**Pass Marks: 35**

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**Part – A (compulsory)**

**Answer the following (10x2=20 Marks)**

- 1** In CE amplifiers, the purpose of input coupling capacitor is to— [2]  
a. Prevent battery current (DC) from flowing into input side  
b. To forward bias the base-emitter  
c. To restrict DC current from flowing into amplifier circuit  
d. To restrict AC current from flowing into amplifier circuit
- 2** If A is the amplifier gain and  $\beta$  is the feedback gain then, which of [2]  
the following represent Barkhausen's Criteria.  
a.  $A\beta = 1$  and  $\angle A\beta = 2\pi n$                       b.  $A\beta > 1$  and  $\angle A\beta = 2\pi n$   
c.  $A\beta = 1$  and  $\angle A\beta = \pi n$                       d.  $A\beta > 1$  and  $\angle A\beta = \pi n$   
Where,  $n = 0, 1, 2, 3, \dots$
- 3** Which class of amplifiers has minimum efficiency— [2]  
a. Class A    b. Class B    c. Class AB    d. None of these
- 4** Which of the following circuits is called a comparator with [2]  
hysteresis?  
a. Oscillator                      b. Amplifier  
c. Sweep Generator              d. Schmitt Trigger
- 5** Briefly describe the concept of virtual ground with respect to a [2]  
OPAMP based inverting amplifier.
- 6** Which of the following digital device may be used to implement [2]  
any two input, single output function.  
a. Two input AND gate              b. 4:1 Multiplexer  
c. Half adder                      d. None of these
- 7** Which of the following is a specification of digital to analog [2]  
convertor?  
a. Turn ON time                      b. End of Conversion  
c. Start of Conversion              d. Conversion Time
- 8** A CMOS circuit is used to implement— [2]  
a. An amplifier circuit              b. An oscillator circuit  
c. A logic gate                      d. All of these

- 9 Which of the following devices may be used in the firing circuit of SCRs. [2]  
a. Transistor      b. UJT      c. FET      d. IGBT
- 10 Which of the AM transmission modes consumes maximum power? [2]  
a. DSB-TC      b. SSB-TC      c. SSB-SC      d. DSC-SC

**Part – B**

**Answer any 5 out of 7 questions (5 x 10= 50 marks)**

- 11 (a) Draw a CE amplifier circuit and explain the purpose of various components. [5]
- (b) With respect to a transistor, derive the expression for  $\alpha$  in terms of  $\beta$  and  $\alpha$  in terms of  $\gamma$ . [5]
- 12 (a) Draw a well labelled diagram of Wein-Bridge oscillator and explain its working. What is the formula for its output frequency? [5]
- (b) An RC Phase shift oscillator, using a BJT and RC network, is to be designed to operate at 1 KHz. If the three resistors in RC phase shift network are  $R_1=R_2=R_3=R=10\text{ K}\Omega$ , and all capacitors to have same values i.e.  $C_1=C_2=C_3=C$ , find the value of C. [5]
- 13 (a) Draw a well labelled diagram of a class AB complementary symmetry push pull amplifier and explain its working. [5]
- (b) Explain the concept of cross-over distortion in class B power amplifier. Suggest a method to mitigate the effect of cross-over distortion. [5]
- 14 (a) Draw well labelled circuit diagram clamper circuit. [5]
- (b) Draw the well labelled circuit diagram and explain working of a 555 timer IC based monostable multivibrator. [5]
- 15 (a) Draw the circuit diagram of an OPAMP based differentiator circuit and derive the expression of its output in terms of input and circuit components. [5]
- (b) Develop an op-amp based circuit so as to produce output voltage  $V_o = 2V_1 - 5V_2 + 10V_3$ , where  $V_1$ ,  $V_2$  and  $V_3$  are external input voltages. [5]

**16 (a)** Explain operation of D flip-flop. Show the truth table and timing diagram. [5]

**(b)** Write an assembly language program to add two 8 bit numbers. [5]

**17 (a)** An AM wave equation is given as, [5]

$$v = 5(1 + 0.6 \sin 150t) \sin(314 \times 10^4 t) \text{ Volts.}$$

What are the minimum and maximum amplitudes of AM Wave? What are the amplitudes and frequencies of message signal, RF carrier and side bands?

**(b)** Draw block diagram and explain the purpose of each block of a super-heterodyne receiver. [5]