Code: AE53/AC53/AT53/AE103   Subject: **ELECTRONIC DEVICES & CIRCUITS**

AMIETE – ET/CS/IT (Current & New Scheme)

Time: 3 Hours | **DECEMBER 2018** | **Max. Marks: 100**

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.
- **Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.**
- **The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.**
- **Out of the remaining EIGHT Questions, answer any FIVE Questions. Each question carries 16 marks.**
- **Any required data not explicitly given, may be suitably assumed and stated.**

Q.1   **Choose the correct or the best alternative in the following:**   **(2×10)**

a. Determine the power loss across the 5Ω resistor in fig.1.
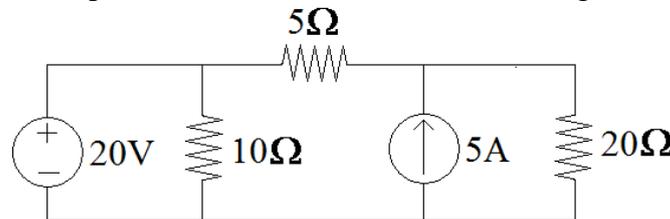

Fig.1

(A) 51.2W   (B) 61.2 W
(C) 50W   (D) 60 W

b. Relationship between the Input and Output frequencies of a half wave rectifier is expressed as
(A) $f = f_i / 2$ (B) $f = 2 f_i$
(C) $f = f_i$ (D) $f = \sqrt{f}$

c. In a MOSFET the threshold voltage can be lowered by
(A) increasing the gate oxide thickness
(B) reducing the substrate concentration
(C) increasing the substrate concentrate
(D) using the dielectric of lower constant

d. The stability factor lies in between
(A) Zero and unity   (B) Zero and infinity
(C) Unity and (1+β)   (D) (1+β) and infinity

e. Which of the following diodes is used for voltage regulation?
(A) PN Junction diode
(B) Light emitting diode
(C) Zener diode
(D) Variable Capacitor diode (Varactor diode)

f. As the collector current I_c increases, the value of f_T
    (A) increases
    (B) decreases
    (C) remains constant
    (D) decreases to a minimum and then increases

g. The open circuit voltage gain 60dB of an amplifier changes by 5%. How much
    change in voltage gain will result with 2% negative feedback?
    (A) 32.8%   **(B)** 23.8%
    (C) 83.2%   **(D)** 72.1%

h. To generate a 1 MHz signal, the most suitable circuit is
    (A) Wein Bridge Oscillator   **(B)** Colpitts Oscillator
    (C) Phase shift oscillator   **(D)** Crystal oscillator

i. Which power amplifier has the maximum distortion
    (A) Class A   **(B)** Class B
    (C) Class AB   **(D)** Class C

j. For the values of drain voltage smaller than gate voltage, a MOSFET acts as a
    voltage controlled
    (A) Current Source   **(B)** Resistor
    (C) Voltage Source   **(D)** Capacitor

Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.

Q.2   a. In the circuit shown in Fig. 2, R dissipates a power of 10W. If |I| = 0.5A, find
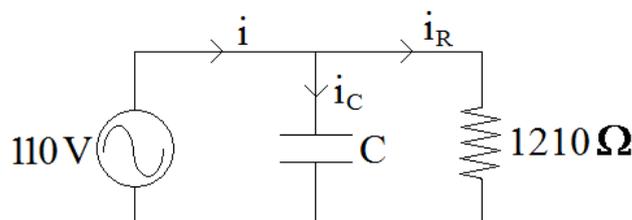   the current drawn by the capacitor and its value.   **(8)**

Fig.2

b. Differentiate between lumped and distributed parameters.   **(2)**

c. State and explain Superposition theorem with the help of a suitable example.
                                                                                     (6)

Q.3   a. For the circuit shown in Fig.3, find the minimum value of 'R' so that the voltage across Zener diode does not fall below 6V.   **(5)**
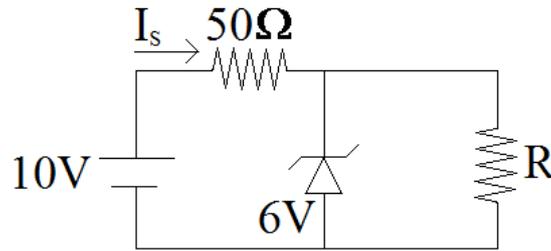

Fig.3

b. What do you mean by TUF of a rectifier? Derive its value for half wave rectifier.   **(5)**

c. Draw and explain the V-I characteristics of diode using current equation of diode.   **(6)**

Q.4   a. Explain the concept of dc and ac load line in case of transistor. What is the necessity of operating point and how it is located?   **(8)**

b. Explain working of N-MOS in enhancement as well as depletion mode.   **(8)**

Q.5   a. Explain the concept of bias compensation. How we can use diode and thermisters for bias compensation?   **(6)**

b. Using h-parameters, derive expression for A_v, R_i, A_i, R_o for C.E configuration with bypass R_E (Emitter resistance).   **(6)**

c. What is Darlington pair? Explain its use.   **(4)**

Q.6   a. Explain the working of complementary symmetry push pull amplifier. Derive its expression for efficiency.   **(8)**

b. In fig. 4 the maximum power developed across the load is 2W for the input signal $i_1 = I_m \sin \omega_0 t$. Obtain $P_{L(max)}$ for the signal expressed as $i_1 = \dfrac{I_m}{2} Sin\omega_0 t + \dfrac{I_m}{2} Sin3\omega_0 t$.
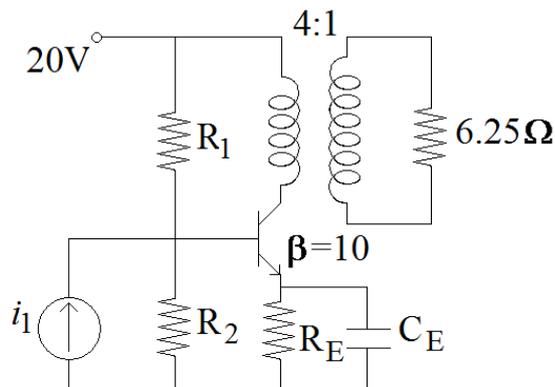

Fig. 4   **(8)**

Q.7   a. Enumerate the benefits of negative feedback.   **(5)**

b. Explain Barkhausen's Criterion. **(4)**

c. Draw and explain working of crystal oscillator. Also derive relation for sustained oscillations. **(7)**

Q.8 a. Explain the steps involved in fabrication of IC in brief. **(8)**

b. Explain various characteristics of IC's **(4)**

c. What do you mean by semiconductor contact? **(4)**

Q.9 a. Derive an expression for the gain of multistage amplifier. **(6)**

b. For an R-C coupled amplifier derive expression for f_L and f_U (Lower and upper cut off frequencies). **(6)**

c. State and explain the concept of gain bandwidth product. **(4)**