

**KIIT Deemed to be University**

**Online End Semester Examination(Autumn Semester-2022)**

**Subject Name & Code:**

**AEC(EC-1004)** **Applicable to Courses:CSE,IT,CSSE,CSCE**

**Full Marks=50** **Time:2 Hours**

**SECTION-A(Answer All Questions. Each question carries 2 Marks)**

**Time:30 Minutes (7×2=14 Marks)**

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| **Question No** | **Question Type (MCQ/SAT)** | **Question** | **CO Mapping** | **Answer Key**  **(For MCQ Questions only)** |
| **Q.No:1** |  | Which of the following statement is true regarding effect of temperature on V-I characteristics of ideal diode   1. The volt equivalent of temperature VT increases with increase in temperature 2. The reverse saturation current doubles for every 10⁰c rise in temperature 3. With the increase of temperature , forward characteristics become more ideal 4. All of these | CO 1 | d |
|  |  | In a PN junction when the applied voltage overcomes the ........ potential, the diode current is large, which is known as .............   1. Depletion, negative bias 2. Reverse, reverse bias 3. Barrier, forward bias 4. Resistance, Reverse bias | CO 1 | c |
|  |  | In a PN junction the potential barrier is due to the charges on either side of the junction, these charges are   1. Minority carriers 2. Majority carriers 3. Fixed donor and acceptor ions 4. None of these | CO 1 | c |
|  |  | In zener regulator, the change in load current, produces change in   1. Zener voltage 2. Zener current 3. Input voltage 4. None of these | CO 1 | b |
| **Q.No:2** |  | In common emitter transistor circuit if current gain is 100 and collector current is 10 mA, the base current is  a)1oo μA  b)10 μA  c) 1 A  d)10 A | CO 2 | a |
|  |  | In CE transistor, Vcc=12V and zero signal collector current is 1 mA. Determine the operating point when collector load(Rc) is 6KΩ  a)12V, 2mA  b)12V, 1mA  c)6V, 2mA  d)6V, 1mA | CO 2 | D |
|  |  | A Si n-p-n transistor with β=100 and ICBO=20μA is connected in CE mode. Find  the collector current for a base current of 0.02mA  (a) 25mA  (b) 25.05A  (c) 2505μA  (d) None of these | CO 2 | d |
|  |  | In a common emitter connection, β is 50.If the base current is 20μA, what is the value of emitter current?   1. 1.02μA 2. 2.00mA 3. 1mA 4. 2.00μA | CO 2 | c |
| **Q.No:3** |  | The ends of a load line drawn on a family of curves determine   1. Saturation and cut off 2. Operating point 3. Amplification factor 4. None of these | CO 2 | a |
|  |  | A transistor as how many doped regions?   1. 1 2. 4 3. 2 4. 3 | CO 2 | d |
|  |  | Which of the following is true for a PNP transistor in active region?  a) CB junction is reversed bias and the EB junction is forward bias  b) CB junction is forward bias and the EB junction is forward bias  c) CB junction is forward bias and the EB junction is reverse bias  d) CB junction is reversed bias and the EB junction is reverse bias | CO 2 | a |
|  |  | Which of the configuration is most popular?   1. CB 2. CC 3. CE 4. none | CO2 | c |
| **Q.No:4** |  | When drain voltage equals the pinch-off-voltage, then drain current …………. with the increase in drain voltage   1. decreases 2. increases 3. remains constant 4. none of the above | CO 3 | c |
|  |  | Choose the correct statement when VGS=0 and VDS=0 in a JFET   1. The depletion region around the p-n junctions are equal in thickness and symmetrical 2. ID is maximum 3. ID is half of the maximum 4. The depletion region around the p-n junctions are not equal in thickness | CO 3 | a |
|  |  | For n-channel field effect transistor running in enhancement mode , a conductive channel is formed only from   1. –ve gate to source voltage 2. +ve gate to source voltage 3. Zero gate to source voltage 4. none of these | CO 3 | b |
|  |  | When drain-source voltage is changed by 1.5 volt, the change in drain current is of 120μA, while gate-source voltage remaining unchanged. The ac drain resistance of JFET will be   1. 125kΩ 2. 1.25kΩ 3. 12.5Ω 4. 12.5kΩ | CO3 | d |
| **Q.No:5** |  | The total gain of a multistage amplifier is less than the product of the gains of individual stages due to \_\_\_\_\_\_\_\_\_\_\_  a)power loss in coupling device  b)Loading effect of next stage  c)Use of many transistors  d) None of these | CO 5 | b |
|  |  | What do you mean by Cascading?   1. process of joining two amplifier stages using a coupling device. 2. process of extracting two amplifier stages using a coupling device. 3. Both a and b. 4. None of the above | CO 5 | a |
|  |  | If a three stage amplifier has individual stage gains of 20db, 5db and 15db; then the total gain in db is   1. 40db 2. 20db 3. 30db 4. 0db | CO 5 | a |
|  |  | The voltage gain over mid- frequency range in an RC coupled amplifier   1. Maximum 2. Changes with frequency 3. Constant 4. None of these | CO 5 | c |
| **Q.No:6** |  | In Class-B amplifier operation, operating point generally located at \_\_\_\_\_\_\_\_\_\_\_ of load line.   1. Middle 2. End position 3. In between mid and end position 4. Difficult to determine | CO 5 | b |
|  |  | An amplifier with negative feedback provides an output voltage of 5v with an input voltage of 0.2v. Gain with feedback will be  a)30  b)25  c)50  d)none of these | CO 5 | b |
|  |  | An amplifier has a voltage gain of 120. To reduce distortion 10% negative feedback is employed. The gain of amplifier with feedback is   1. 12 2. 92.3 3. 9.23 4. None of these | CO 5 | c |
|  |  | Which oscillator is characterized by a split capacitor in its tank circuit   1. Colpitts oscillator 2. RC Phase shift oscillator 3. Wien bridge oscillator 4. None of these | CO 5 | a |
| **Q.No:7** |  | A Schmitt trigger is a digital circuit that produces  (a)Sinusoidal output for any type of input  (b) Rectangular output for any type of input  (c)Triangular output for sinusoidal input  (d)none of these | CO 6 | b |
|  |  | A non inverting amplifier has Ri=1kΩ and Rf =100kΩ.If input voltage is 5V then output voltage is will be------------  (a)500V  (b)50.5V  (c)505V  (d)501V | CO 6 | c |
|  |  | https://www.sanfoundry.com/wp-content/uploads/2017/08/linear-integrated-circuit-questions-and-answers-ideal-operational-amplifier-q1.png  The output voltage of the given circuit will be  (a)same as input signal  (b)180⁰ in phase with the input signal  (c)180⁰ out of phase with the input signal  (d)none of these | CO 6 | c |
|  |  | For a given op-amp, CMRR is 105 and differential gain is 105 . The common mode gain of op-amp will be  (a)1  (b)2  (c)3  (d)0 | CO 6 | a |

**SECTION-B(Answer Any Three Questions. Each Question carries 12 Marks)**

**Time: 1 Hour and 30 Minutes** **(3×12=36 Marks)**

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| **Question No** | **Question** | **CO Mapping**  **(Each question should be from the same CO(s))** |
| **Q.No:8** | a) Define the term PIV. Calculate PIV for all types of rectifiers.  Draw and explain all the steps of the output waveform for the circuit shown below. (Assume diode **D** is ideal diode) | C01 |
| 1. Explain the working of a center tapped full wave rectifier and write how it is different from bridge full wave rectifier. 2. Find the peak, average and rms value of current, efficiency, ripple factor and PIV of center tapped full wave rectifier with diode forward resistance of 50Ω supplies power to a load resistance of 1200Ω from a.c voltage of 20sin(200∏t) |
| 1. Explain the operation of a zener diode as a voltage regulator. 2. Draw the output voltage wave forms for the given circuit shown in Figures with proper explanation. |
| **Q.No:9** | a) What is the need of biasing transistor? Construct a fixed bias circuit and find the expression of output current and voltage.  b)Determine ,,  and VC for a germanium transistor in fixed biasing configuration using the parameter given  RB=250kΩ, RC=2.2kΩ, β=200, | CO 2 |
| a) Briefly explain about the significance of Q- point with suitable diagram. Differentiate between CE, CB and CC configuration in terms of current gain, voltage gain, input and output impedance and total current expression  b)Solve to find IB, IC and VCE for a fixed bias BJT circuit of a Si transistor, VCC = 20V, RB = 100KΩ and RC = 2 KΩ and β = 100.  . |
| 1. Define dc load line for an NPN transistor connected in CE Configuration with suitable diagram. Explain, why biasing is important for transistors? Derive the relationship between leakage current ICEO and ICBO.   b)Determine , , , VC for a silicon transistor in fixed biasing configuration using the parameter given RB =240kΩ, RC=2.2kΩ, β=50, |
| **Q.No:10** | a) How FET is different from BJT? Draw and explain the physical structure, circuit symbol, drain characteristics and transfer characteristics of a n- channel JFET.  b)Explain the operation of a CMOS inverter with suitable diagram | CO3/4 |
| a) Draw and explain the physical structure, circuit symbol, drain characteristics and transfer characteristics of a n- channel Depletion type MOSFET.  b) Briefly explain the different JFET parameters and find the relationship between them. Find Drain current of an n-channel D-MOSFET. If IDSS = 10 mA & Vp = - 6 V, VGS = - 2 V. |
| a) Draw and explain the physical structure, circuit symbol, drain characteristics and transfer characteristics of a n- channel E-MOSFET.  b) Explain briefly about CE RC coupled amplifier using BJT and calculate its gain, input and output impedance using re equivalent model. |
| **Q.No:11** | a) Define class A, class B and class C power amplifier. Explain the operation of class B push pull amplifier with proper diagram.  b) What is Barkhausen criteria of oscillation? Draw the circuit of Hartley LC oscillator explain its operation and write its frequency of oscillation. | CO5/6 |
| a) Derive the gain of a positive and negative feedback amplifier. Also analyze and explain the circuit diagram of integrator and inverting amplifier using OP-AMP with their output voltage expression  b) In a negative feedback amplifier, closed loop gain is given as 10, feedback factor is 0.1, calculate the open loop gain of the amplifier |
| a) Find the output voltage V0 of the following circuit. Given R1=12kΩ, R2=2kΩ, R3=3kΩ, RF=12kΩ, V1=9V, V2=-3V and V3=1V. The OPAMP is biased with +12V DC power supply.    b) Explain the concept of virtual ground in op-amp. Analyze and explain the circuit diagram of differentiator and non-inverting amplifier using OP-AMP with their output voltage |