**Bihar Engineering University, Patna**
**End Semester Examination - 2022**

*Course: B.Tech.* *Semester: III* *Time: 03 Hours*
*Code: 100302* *Subject: Analogy Electronics Circuits* *Full Marks: 70*

***Instructions:-***
*(i) The marks are indicated in the right-hand margin.*
*(ii) There are **NINE** questions in this paper.*
*(iii) Attempt **FIVE** questions in all.*
*(iv) Question No. **1** is compulsory.*

***Q.1*** ***Choose the correct answer of the following (Any seven question only):*** **[2 x 7 = 14]**

(a) For a base current of 10μA, what is the value of collector current in common emitter if $\beta_{dc}$= 100?
(i) 10 μA (ii) 100 μA
(iii) 1mA (iv) 10mA

(b) If an amplifier with gain of -1000 and feedback factor β= -0.1 had a gain change of 20% due to temperature, the change in gain of the feedback amplifier would be
(i) 10% (ii) 5%
(iii) 0.2% (iv) 0.01%

(c) A trivalent impurity has ..... Valence electrons.
(i) 4 (ii) 5
(iii) 6 (iv) 3

(d) Zener diodes are used primarily as .....
(i) Amplifiers (ii) Voltage regulators
(iii) Rectifiers (iv) Oscillators

(e) **Peak inverse voltage of diode used in Half-wave rectifier is**
(i) 2Vm (ii) Vm/2
(iii) Vm (iv) Vm/3

(f) For every $10^0$C increase in temperature, the reverse saturation current of a p-n junction will be increased by:
(i) 10 times (ii) 2 times
(iii) 4 times (iv) Remain same

(g) A BJT transistor operates in which region when the base-emitter junction is forward-biased and the base-collector junction is reverse-biased?
(i) Active region (ii) Saturation region
(iii) Cutoff region (iv) Reverse active region

(h) In an RC phase shift oscillator, the phase shift provided by each RC stage is :
(i) 30 degree (ii) 45 degree
(iii) 60 degree (iv) 90 degree

(i) If the PIV rating of a diode is exceeded
(i) the diode conducts poorly (ii) the diode is destroyed
(iii) the diode behaves as Zener diode (iv) None of the above

(j) For $I_{DSS}$ = 9 mA and $V_p$ = - 3.5V, $I_D$ for $V_{GS}$ = 0V is
(i) 8 mA (ii) 9 mA
(iii) 10 mA (iv) 11 mA

***Q.2*** (a) Define the following:
(i) Common mode rejection ratio (CMRR)
(ii) Gain bandwidth product
(iii) Slew rate of op-amp **[7]**

(b) State the Barkhausen condition for an electronic system to oscillate with feedback. [7]

*Q.3* (a) Derive the expression for stability factor for fix bias circuit with respect to $I_{CO}$, $V_{BE}$ and β. [7]

(b) A voltage divider biased circuit has $R_1$=39kΩ, $R_2$=82kΩ, $R_C$=3.3kΩ, $R_E$=1kΩ and CC=18V. The silicon transistor has used β = 120. Find Q – point and stability factor. [7]

*Q.4* (a) With the help of block diagram, explain the concept of feedback. [7]

(b) Discuss with the help of circuit example, the purpose of providing – [7]

(i) negative feedback;

(ii) positive feedback in amplifier.

*Q.5* (a) With a neat circuit diagram and waveforms, explain the working of full wave bridge rectifier and show that its ripple factor is 0.48. [7]

(b) Describe in detail the avalanche and Zener breakdown mechanism in Zener diode. [7]

*Q.6* (a) Derive the expression for output voltage of an instrumentation amplifier. Also write its advantages and disadvantages [8]

(b) For an N-channel MOSFET the parameters given as $\mu C_{ox}\frac{w}{L} = \frac{0.2mA}{V^2}, V_{DS} = 0.2V,$ and $V_t = 0.7V$. Find the region of operation and the drain current. [6]

*Q.7* (a) Differentiate between JFET and BJT indicating the advantages and disadvantages. [7]

(b) What is faithful amplification? Explain the conditions to be fulfilled to achieve faithful amplification in transistor amplifier. [7]

*Q.8* (a) Draw and explain the pin configuration of a 741 Op-Amp. Also explain the internal structure of an Op-Amp with the help of block diagram. [7]

(b) For the circuit shown below. Assume zener voltage to be 4.78v and voltage drop across the forward biased zener to be 0.7v. Find the peak voltage of output. [7]

*Q.9* (a) State the characteristics of an ideal transformer. [2]

(b) Define *rms* value, form factor, peak factor, complex power and half power frequency. [5]

(c) Two two-port network a and b, with open-circuit impedances $Z_a$ and $Z_b$ are connected in series. Drive the Z-parameter equations. [7]

Circuit of Question No. 8(b)