J11

GOVERNMENT OF KARNATAKA

KARNATAKA STATE PRE-UNIVERSITY EDUCATION EXAMINATION BOARD

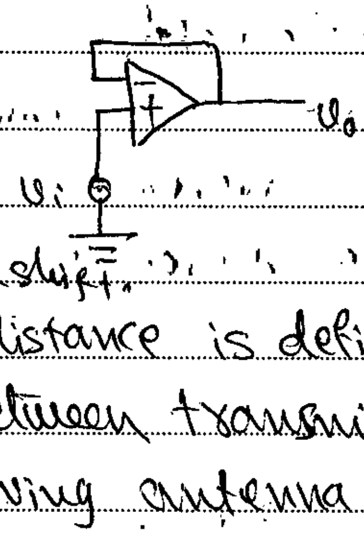
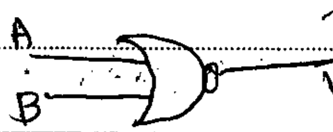
II YEAR PUC EXAMINATION

# SCHEME OF VALUATION

OS

2015

Subject Code : 40    Subject : ELECTRONICS

| Qn. No. | | Marks |
|---|---|---|
| | PART – A | |
| 1. | Emitter region | 1 |
| 2. | CB Amplifier | 1 |
| 3. | A feedback in which a part of the output fedback to the input out of phase with it is called negative feedback. | 1 |
| 4. |  | 1 |
| 5. | 180° phase shift. | |
| 6. | The Skip distance is defined as the minimum distance between transmitting antenna and first receiving antenna (station) measured along the surface of Earth after the reflection from the ionosphere. | 1 |
| 7. | $m_a = 0.8$ | 1 |
| 8. | $(1000\ 0010)_{BCD}$ | 1 |
| 9. |  $Y = \overline{A+B}$ | 1 |

PTO....

| Qn. No. | | Marks |
|---|---|---|
| 10. | Code division multiple access. | 1 |
| | PART – B | |
| 11. | Q-point is the intersection point of the DC load line and the output characteristic of a transistor. | 1 |
| | $Q(V_{CEQ}, I_{CQ})$ | 1 |
| 12. | $\beta = \frac{I_C}{I_B} \Rightarrow I_C = \beta I_B = 150 \times 10 \times 10^{-6} = 1.5\,mA$ | 1 |
| | $I_E = I_C + I_B = 1.5\,mA + 150\,\mu A = (1.5 + 0.15)\,mA = 1.65\,mA$ | 1 |
| | Ans: $I_C = 1.5\,mA$, $I_E = 1.65\,mA$ | |
| 13. | a) Frequency bandwidth increases. b) Gain will be stabalized. c) Noise and distortion will be reduced. d) Input impedance increases. e) output impedance decreases. any four (½ m each) | 2 |
| 14. | $A_f = \frac{A}{1 + A\beta}$ | 1 |
| | $A_f = \frac{100}{1 + 100 \times 0.1} = \frac{100}{11} = 9.091$; $A_f = 9.091$ | 1 |
| 15. | a) voltage gain is $-\infty$, b) Input impedance is $\infty$ c) output impedance is 0, d) CMRR is $\infty$. e) Frequency bandwidth is $\infty$ — any four (½ m each) | 2 |

PTO----

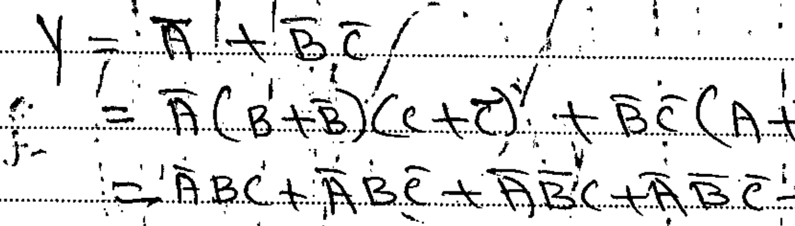
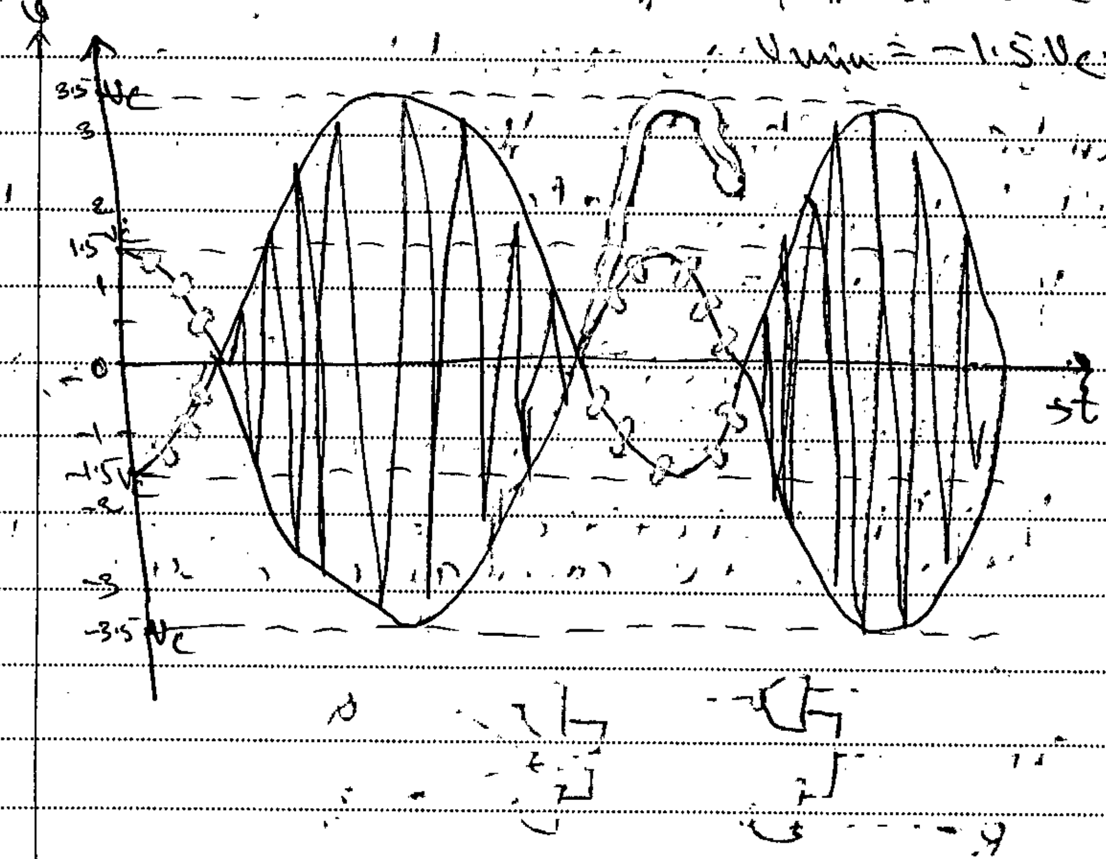
| Qn. No. | | Marks |
|---|---|---|
| 16 | $A_v = -\left(\frac{R_f}{R_i}\right) = -\frac{10\times10^3}{2\times10^3} \Rightarrow A_v = -5$ | 1 |
| | $v_0 = I_L R_L = A_v \cdot v_i = -5\times0.5 = -2.5\,V$   $\boxed{v_0 = -2.5\,V}$ | 1 |
| 17 | see table below (1 mark each) | 2 |
| 18 | XNOR gate is a logic gate its output is high when all the inputs are low or even numbes of inputs are in high state | 1 |
| | Using only NAND gates, all the logic gates can be constructed. Hence NAND is called universal gate. | 1 |
| 19 | $Y = \bar{A} + \bar{B}\bar{C}$ <br> $= \bar{A}(B+\bar{B})(C+\bar{C}) + \bar{B}\bar{C}(A+\bar{A}) \longrightarrow$ | 1 |
| | $= \bar{A}BC + \bar{A}B\bar{C} + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C}$ <br> $Y = \bar{A}BC + \bar{A}B\bar{C} + \bar{A}\bar{B}C + \bar{A}\bar{B}\bar{C} + A\bar{B}\bar{C} \longrightarrow$ <br> This is the canonical form of SOP eqn. | 1 |
| 20 |  $\longrightarrow$ | 2 |

Table for Q17:

| sky wave | Ground wave |
|---|---|
| wave which is travelling to the receiving antenna directly or due to reflection by the ionosphere. | wave which travels directly or by the reflection from the Earth reches the receiving antenna. |

1 mark each

| Qn. No. | | Marks |
|---|---|---|
| 21. | It is the process of using the same carrier frequency in different cells that are geographically separated. | 1 |
| | Each cell structure is of hexagon shape so that signal covers all the area. The same frequency will be used in two or more cells which are not adjacent to each other. This would increase the number of subscribers. | 1 |
| 22. | $m_a = \frac{V_m}{V_c} \Rightarrow V_m = m_a V_c$ <br> $V_{max} = V_c + V_m = V_c + m_a V_c = (1+m_a)V_c$ <br> $V_{max} = 3.5 V_c$ <br> $V_{min} = V_c - V_m = V_c - m_a V_c = (1-m_a)V_c$ <br> $V_{min} = -1.5 V_c$ | 1 |
| |  | 1 |

PTO.

| Qn. No. | | Marks |
|---|---|---|

## PART – C

I. 23. L = 10 mH.

| Tr. No. | $C_1$ in μF | $C_2$ in μF | T in μs | Practical freq. $f = \frac{1}{T}$ in Hz | Theoretical freq. $f = \frac{1}{2\pi\sqrt{LC}}$ in Hz |
|---|---|---|---|---|---|
| 1. | 0.01 | 0.02 | 1.62 | 617.28 K | 616.2 K |
| 2. | 0.15 | 0.22 | 5.95 | 168.07 K | 168.5 K |

Practical frequency $= f = \frac{1}{T} = \ldots$ Hz

Theoretical frequency $= f = \frac{1}{2\pi\sqrt{LC}} = \ldots$ Hz

where $C = \frac{C_1 C_2}{C_1 + C_2}$ — 1

Trial no. 1: $\frac{C_1 C_2}{C_1 + C_2} = \frac{0.01 \times 0.02}{0.01 + 0.02}$ μF $= \frac{0.02}{3}$ μF

Theoretical freq. $f_1 = \frac{1}{2\pi\sqrt{LC}} = \frac{0.159}{\sqrt{10\times10^{-6} \times \frac{0.02}{3} \times 10^{-6}}} = 616.189 \simeq 616.2$ kHz — 1

Practical freq. $f_1 = \frac{1}{T} = \frac{1}{1.62 \times 10^{-6}} = 617.28$ kHz — ½

Trial no. 2:

$\frac{C_1 C_2}{C_1 + C_2} = \frac{0.15 \times 0.22}{0.15 + 0.22}$ μF $= \frac{3.3}{37} \times 10^{-6}$

Theoretical $f_2 = \frac{1}{2\pi\sqrt{LC}} = \frac{0.159}{\sqrt{10\times10^{-6} \times \frac{3.3}{37} \times 10^{-6}}} = 168.466$ kHz $\simeq 168.5$ kHz — 1

Practical $f_2 = \frac{1}{T} = \frac{1}{5.95 \times 10^{-6}} \simeq 168.1$ kHz — ½

PTO....

| Qn. No. | | Marks |
|---|---|---|
| | OR | |

$V_i = 0.25V$

| Tr. No. | $R_i$ in kΩ | $R_f$ in kΩ | $V_0$ in V | Practical gain $A_V = \frac{V_o}{V_i}$ | Theoretical gain $A_V = (1 + \frac{R_f}{R_i})$ |
|---|---|---|---|---|---|
| 1 | 1 | 10 | 2.75 | | |
| 2 | 4.7 | 20 | 1.314 | | |

Practical gain $= A_V = \frac{V_o}{V_i}$

Theoretical gain $= A_V = 1 + \frac{R_f}{R_i}$ — 1

Trial 1: Pr. gain $A_V = \frac{V_o}{V_i} = \frac{2.75}{0.25} = 11$

The gain $A_V = 1 + \frac{R_f}{R_i} = 1 + \frac{10}{1} = 11$ — 1½

Trial 2: Pr. gain $A_V = \frac{V_o}{V_i} = \frac{1.314}{0.25} = 5.256$

The gain $A_V = 1 + \frac{R_f}{R_i} = 1 + \frac{20}{4.7} = 5.255$ — 1½

II.

24. Cascading ______ 1

necessity ______ 1

$A_V = \frac{V_o}{V_i} = \frac{2.5}{20 \times 10^{-3}} = 125$ ______ 1

$G = 20 \log A_V = 20 \log 125 = 20 \times 2.0969$

$= 41.938$ dB — 1

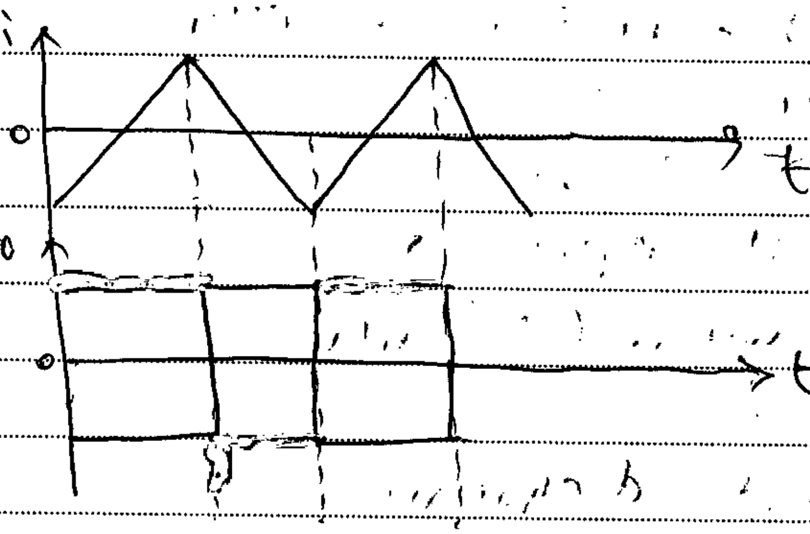
| Qn. No. | | Marks |
|---|---|---|
| 25. | Any two comparisions (each carries 2m) | 4 |
| 26. | $V_2 = \frac{V_{CC} R_2}{R_1+R_2} = \frac{12\times5\times10^3}{(27+5)10^3} = 1.875\,V$ ; $I_E = \frac{V_2 - V_{BE}}{R_E} = \frac{1.875-0.3}{1\times10^3} = 1.575\,mA$ | 1 |
| | $r_e' = \frac{52\,mV}{I_E} = \frac{52\times10^{-3}}{1.575\times10^{-3}} = 33.02\,\Omega$ | 1 |
| | $A_V = \frac{-R_C \Vert R_L}{r_e'} = \frac{-(27\Vert5)10^3}{33.02} = -53.096$ | 1 |
| | $\beta r_e' = 100\times33.02 = 3.302\,k\Omega$ ; $Z_{in} = R_1 \Vert R_2 \Vert \beta r_e' = 27\Vert5\Vert3.302\,k\Omega = 1.852\,k\Omega$ | 1 |
| 27. | Block diagram | 1 |
| | Arriving at the expression $A_V = \frac{A}{1+A\beta}$ | 3 |
| 28. | $f = \frac{1}{2\pi RC}$ | 1 |
| | $= \frac{1}{2\times3.142\times1\times10^3\times0.1\times10^{-6}}$ | 1 |
| | $= \frac{0.1591}{10^{-4}}$ | 1 |
| | $f = 1591\,Hz$ | 1 |

PTO

| Qn. No. | | Marks |
|---|---|---|
| 29 | $v_{FM} = 100 \sin[18\pi \times 10^7 t + 6 \sin\pi \times 10^4 t]$ | |
| | $v_{FM} = V_c \sin[2\pi f_c t + m_f \sin 2\pi f_m t]$ | 1 |
| | comparing $m_f = 6$, $2\pi f_m = \pi 10^4 \Rightarrow f_m = 5\,kHz$ | 1 |
| | $2\pi f_c = 18\pi \times 10^7 \Rightarrow f_c = 90\,MHz$ | 1 |
| | $\Delta f = m_f f_m = 6 \times 5 \times 10^3 \Rightarrow \Delta f = 30\,kHz$ | 1 |
| | $\% m_f = \frac{\Delta f_{max}}{\Delta f} \times 100 = \frac{75 \times 10^3}{30 \times 10^3} \times 100 = 250\%$ | 1 |
| | $m_f = 6$, $f_m = 5\,kHz$, $f_c = 90\,MHz$, $\Delta f = 30\,kHz$, $\% m_f = 250\%$ | |
| 30. | Block diagram | 2 |
| | Explanation | 2 |
| 31. | Full adder using HA | 2 |
| | $Sum = A \oplus B = A\bar{B} + \bar{A}B$ | 1 |
| | $carry = AB$ | 1 |
| | PART - D | |
| I. 32. | Pinout diagram of IC 7400 | 1 |
| | Verification of TT with NAND equivalent ckt. | |
| | NOT | 1 |
| | OR | 1 |
| | AND | 1 |
| | XOR | 2 |
| | OR | |

| Qn. No. | | Marks |
|---|---|---|
| | Pinout diagram of IC741 | 1 |
| | Circuit diagram | 1 |
| | Tabular column | 1 |
| | output equation | 1 |
| | Explanation (procedure) | 2 |
| II. | | |
| 33 a) | Circuit diagram | 1 |
| | Explanation of stabilization | 2 |
| | Equation $I_E \approx I_C$, $V_{CE} = V_{CC} - I_C(R_C + R_E)$; $V_Z = V_{BE} + V_E = V_{BE} + I_E R_E$ | 1 |
| b) | $R_i = \frac{\Delta V_i}{\Delta I_B} = \frac{\Delta V_{BE}}{\Delta I_B} = \frac{0.75 - 0.70}{(30-5)10^{-6}}$ | 1 |
| | $R_i = \frac{0.05}{25 \times 10^{-6}} = 2\,k\Omega$ | 1 |
| 34. | Circuit diagram | 1 |
| | waveforms | 1 |
| | Explanation i. working during +ve half cycle | 2 |
| | ii. working during −ve half cycle | 2 |
| 35. a) | Circuit diagram | 1 |
| | Arriving at the equation $V_o = -RC \frac{dV_i}{dt}$ | 3 |

PTO....

| Qn. No. | | Marks |
|---|---|---|
| b. |  | 2 |
| 36.a) | Circuit diagram | 1 |
| | Equation — $f = \frac{1}{2\pi\sqrt{(L_1+L_2)C}}$ | 1 |
| | Explanation | 2 |
| b) | [illegible] | 1 |
| | Two disadvantages | 2 |
| 37.a) | Derivation of power relations. | |
| | $P_t = P_c\left(1+\frac{m_a^2}{2}\right)$ | 2 |
| | $P_{SB} = P_c \frac{m_a}{2}$ | 1 |
| | $P_{SB} = P_t\left(\frac{m_a^2}{2+m_a^2}\right)$ | 1 |
| b) | Defination of – signal to Noise ratio | 1 |
| | – fidelity | 1 |
| 38. | Circuit diagram of MSFF | 2 |
| | Working | 3 |
| | Truth table | 1 |

PTO....

| Qn. No. | | Marks |
|---|---|---|

39. a) K – map — 1

| | $\bar{C}\bar{D}$ | $\bar{C}D$ | $CD$ | $C\bar{D}$ |
|---|---|---|---|---|
| $\bar{A}\bar{B}$ | 1 | 1 | 1 | 1 |
| $\bar{A}B$ | X | 1 | 0 | X |
| $AB$ | 1 | 1 | 0 | X |
| $A\bar{B}$ | X | 1 | X | 1 |

→ rolling octate 2: $\bar{B}$

→ rolling octate 1: $\bar{D}$

→ octate: $\bar{C}$

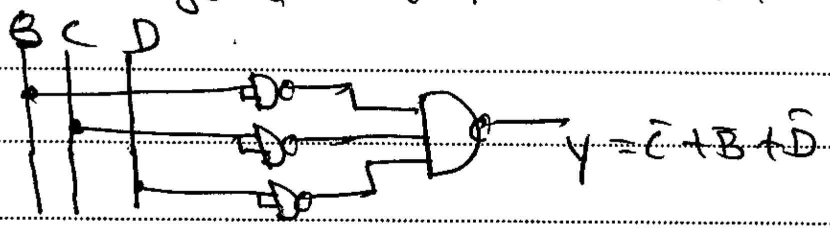
$$Y = \bar{C} + \bar{B} + \bar{D}$$

Entering 0s, 1s & Xs in different cells of K-map — 1

Proper grouping — 1

Final equation $Y = \bar{C} + \bar{B} + \bar{D}$ — 1

NAND gate equivalent ckt — 2




40. Block diagram of monochrome TV receiver — 3

Function of each block — 3