(b) Why does a free neutron does not decay into an electron and a positron ?

(c) Check if the following reaction are allowed or forbidden in strong interaction.

(i) $\pi^- + n \rightarrow \sum^- + K^0$

(ii) $\pi^- + p \rightarrow \wedge^0 + K^0$ 2+1+2

10. (a) Which are the properties, of the solids, that change from normal to superconducting state ?

(b) 'Zero resistance and perfect diamagnetism are two independent criteria for superconductivity'–Explain the statement. 2+3

11. (a) What is cooper pair ?

(b) Calculate the current flowing through a Josephson's junction when dc source is applied to it. 1+4

12. (a) Below 10K, what are the important cryogenic temperatures ? What is λ point ?

(b) What are the special properties of superfluid Helium ? 3+2

—— X ——

Ex:B.SC/PHY/32/H14/GR-A/79/2019

FINAL B.Sc. EXAMINATION, 2019

(3rd Year, 2nd Semester)

PHYSICS (HONOURS)

Paper : HO-14

Time : Two hours Full Marks : 50

Use separate answer-script for each group.

GROUP - A

(Electronics Devices and Circuit II)

Answer ***q.no. 5*** and any ***three*** from the rest. 7x3+4

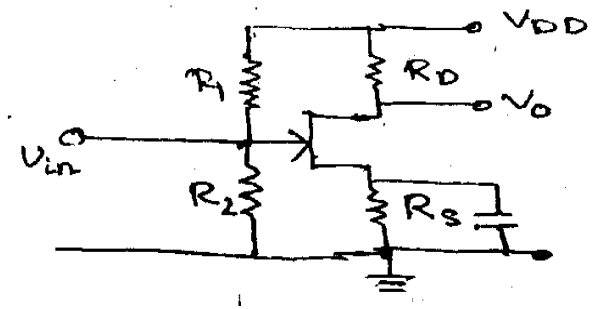
1. (a) Draw the circuit diagram of a two stage RC coupled transistor amplifier and obtain expression for the voltage gain of this amplifier in low frequency range.

(b) The mid-frequency gain of an amplifier is 120. Find its lower half power frequency if at frequency 100 Hz, the gain falls to 60. 5+2

2. (a) Draw a circuit diagram of Class A direct coupled power amplifier and show its maximum efficiency is 25%.

(b) Mid frequency gain and bandwidth of an amplifier are 100 and 20 KHz respectively. What would be the new bandwidth if negative feedback of feedback ratio $\beta = 0.02$ is introduced ? 5+2

3. (a) A n-channel JFET has I_{DSS} = 12 mA. If the transconductance gm at V_{GS} = 0 is 4 millimho, find the pinch-off voltage.
   (b) The amplifier circuit uses a n-channel FET with V_P = –2V and I_{DSS} = 10 mA. Given V_{DD} = 20V, R_1 = 12 MΩ, R_2 = 8 MΩ, R_D = 1 KΩ and R_S = 2k. Calculate the drain current (I_D).



2+5

4. (a) State and explain Barkhausen crierion for sustained oscillation.
   (b) Draw a circuit diagram of a Hartley oscillator and calculate its frequency of oscillation. 2+5

5. Write short note (any ***two***) : 2x2=4
   (a) Emitter follower
   (b) Advantages of negative feedback
   (c) Crystal Oscillator

GROUP - B (25 marks)
Answer any ***five*** questions.

6. The most successful postdictions between theory and observations of cosmic abundances that we probably do know, correspond a great deal about the state of the Universe during the era spaning 1 to 1000 sec. With the help of Wagonar diagram, briefly describe how the abundances of light elements produce during cosmic nucleosynthesis in this era. 5

7. (a) Write down the names of the elementary particles such as Quarks, Leptons, and Mediators in Standard Model. Listed them in terms of Bosons and Fermions ?
   (b) Explain the CPT violation (if any) with an example. 3+2

8. (a) Which particles correspond to quarks compositions uud and udd ? Write down the quarks compositions of the $\left(\sum^{+}, \sum^{\circ}, \sum^{-}\right)$ particles.
   (b) The decay $\sum^{0} \rightarrow \wedge^{0} + \gamma$ is observed in nature whereas apparently similar decay $\sum^{+} \rightarrow p^{+} + \gamma$ is never observed. Why ? 1+2+2

9. (a) A hadron is symbolized by Ω^{-}. What are its spin, parity, isospin, strengness, and hypercharge ? Is it a boson or a fermion?