MAHATMA GANDHI UNIVERSITY

IV SEMESTER B.Sc. (Programme) EXAMINATION………YEAR

PH4B01U – Electronics(Model I, Model II and Model III)

Instructions:
1. The time allotted for the examination is 3 hours.
2. Answer **all** questions in **Part A**. This contains 4 bunches of 4 objective/one word answer type questions. For each bunch, Grade A will be awarded if all the 4 answers are correct, B for 3, C for 2, D for 1 and E for 0.Answer **any 5** questions from **Part B**, **any 4** from **Part C** and **any 2** from **Part D.**
3. Candidates can use Scientific, nonprogrammable calculators/mathematical tables.

PART A (Objective/One-word answer type. Weight 1 each)
Answer all questions

1. The width of depletion region of a PN junction diode ………. with reverse bias.
2. The ripple factor of a bridge rectifier is …………
3. In a shunt capacitor filter, ripple decreases with …….. in load resistance.
4. Without a dc source, a clipper acts like a ....

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5. The input and output signals of a common emitter amplifier are
    (a) always equal (b) out of phase (c) always negative (d) in phase
6. A transistor has it's $\alpha = 0.975$. It's value of β = ………
    (a) 390 (b0 39 (c) 0.025 (d) 0.493
7. The leakage current of a transistor I_{CBO} flows through
    (a) emitter, base and collector leads (b) emitter and collector leads (c) emitter and base leads (d) collector and base leads.
8. In a class A amplifier, conduction extends over 360o because the Q-point is
    (a)located on load line   (b) located near saturation point
    (c) centered on load line (d) located at or near cut-off point.

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9. The advantage of using negative feed back in an amplifier is that it's gain can be practically independent of
    a. temperature changes (b) age of the components
    (c) frequency   (d) all of the above
10. For obtaining sustained oscillations in an oscillator,
    (a) the feedback factor should be unity (b) phase shift should be 0° or $n\pi$
    (c) the feed back should be negative   (d) both (a) and (b) above
11. An ideal opamp has
    (a) infinite A_v (b) infinite R_i (c)zero R_o (d) all the above
12. For a given carrier wave, maximum undistorted power is transmitted when the value of modulation factor is
    (a) 1 (b) 0.75 (c) 0.5 (d) 0

13. The closed loop gain of feed back amplifier is the gain obtained when
    (a) it's output terminals are closed (b) it's input terminals are closed
    (d) the feed back loop is closed   (d) negative feed back is applied
14. The gain of an ideal opamp is around
    (a) 1,000,000 (b) 1000 (c) 100 (d) 10
15. A transistor Hartley oscillator uses
    (a) resistive feed back   (b) inductive feed back
    (c) capacitive feed back (d) both capacitive and inductive feed back.
16. In an AM system, full information can be conveyed by transmitting
    (a) the carrier   (b) only the upper sideband
    (c) only the lower sideband (d) any one sideband.
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Part-B (Short answer questions-weight 1 each)
Answer any 5 questions
17. What is junction capacitance?
18. What is the primary function of clippers and clampers?
19. Draw the circuit of a shunt capacitor filter.
20. What do you mean by thermal runaway in transistors?
21. What are h-parameters?
22. What is the Barkhausen condition for sustained oscillations in an oscillator?
23. Explain the concept of virtual ground as applicable to opamp circuits?
24. Why is detection(demodulation) necessary in radio receivers?

Part-C (Short essay/Problems-Weight 2 each)
Answer any 4 questions
25. The saturation current density of a p-n junction Ge diode is 250 mA/m^2 at 300K. Find the voltage that would have to be applied across the junction to cause a Forward current density of 10^5 A/m^2 to flow.
26. Explain the action of π-section filter and calculate the ripple factor.
27. What are the different configurations of a transistor? Which is the preferred configuration for operating a transistor as an amplifier? Why?
28. A common emitter transistor amplifier, biased using the voltage divider bias method has the following circuit components. Find the Q-point. Also draw the dc load line.
    V_{cc}= 20V, R_L= 4.7K. R_E = 1K, R_1= 100K, R_2 = 10K (Neglect V_{BE})
29. Find the output voltage of an opamp inverting adder for the following sets of Input voltages and resistors. In all cases, R_f= 1MΩ
    v_1 = -3V, v_2 = +3V, v_3 = +2V, R_1 = 250K, R_2 = 500K, R_3 = 1MΩ
30. Obtain an expression for the power of side bands of an amplitude modulated wave, in terms of (a) total power (b) carrier power.

Part-D (Essay type questions. Weight 4 each)
(Answer any 2 questions)

31. Draw the circuit diagram of a centre tapped full wave rectifier. Explain the working and derive expressions for the efficiency and ripple factor.

32. Discuss the different methods of biasing a transistor. Why the voltage divider bias method is the most popular one?

33. Explain the principle of feed back in amplifiers. Discuss the advantages of negative feed back. What is the use of + feed back?

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