ELECTRONIC SCIENCE

PAPER—II

NOTE: This paper is of two hundred (200) marks containing four (4) sections. Candidates are required to attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION - I

Note : This section contains five (5) questions based on the following paragraph. Each question should be answered in about thirty (30) words and each question carries five (5) marks.

(5x5=25 marks)

The broad definition of a transducer includes devices which convert mechanical energy into electrical energy. These devices form a very large and important group of transducers commonly used in industrial instrumentation. Many physical parameters such as heat, intensity of light, sound, vibration, acceleration, pressure, magnetic field, liquid level, noise, force, etc., may be converted into electrical signal by means of the electrical transducers. These transducers provide an output signal in the form of electrical signal when stimulation by a mechanical or a non-mechanical input, for example, a photoconductor converts light intensity into change of resistance, a thermocouple converts heat energy into electrical voltage, a force produces a change in resistance in a strain gauge, an acceleration produces a voltage in a piezoelectric crystal and so on. In all cases, however, the electrical output is measured by standard methods; giving the magnitude of the input quantity in terms of an analogous output.

1. Differentiate between the active and passive transducers.

2. Explain the working principle of a thermocouple.

3. Describe the Hall effect and its application in transducers.

4. State the piezoelectric effect and explain how it is utilized in transducers for the measurement of force.

5. Explain the operating principle of a photovoltaic cell.

SECTION - II

Note : This section contains fifteen (15) questions each to be answered in about thirty (30) words. Each question carries five (5) marks.

(5x15=75 marks)

6. Draw the hybrid equivalent circuit of a BJT in CE configuration and explain the physical meaning of different h - parameters used in the circuit

7. State and prove Thevenin's theorem.

8. Compare capacitive and inductive transducers with regard to their utility.

9. Draw a Schmitt trigger circuit and explain its working.

10. Define the reverse recovery time and reverse recovery current of the power diodes.

11. Give the method for the fabrication of npn monolithic transistors.

12. Define slew-rate in an operational amplifier. How off-set is adjusted in an operational amplifier ?

13. Draw an equivalent circuit of a TRIAC and a circuit diagram using TRIAC for controlling AC power.

14. Prove the following are the Exclusive-NOR function.

(a) $(A+B)(\overline{A}+\overline{B})$,

(b) $\overline{AB+\overline{A}\,\overline{B}}$

15. Explain the vectored interrupt and device polling.

16. Define quantization noise. Which type of modulation employs quantization and explain how ?

17. Describe the need and method of use of pointers in C.

18. Compare the characteristics of n-channel and p-channel JFETs.

19. Define gain and radiation efficiency of an antenna. Write the properties of an isotropic antenna.

20. With the help of a schematic diagram, describe the working principle of a two - cavity klystron.

SECTION - III

Note : This section contains five (5) questions of twelve (12) marks each. Each question is to be answered in about two hundred (200) words.

(12x5=60 marks)

21. Draw an equivalent circuit of a lossy transmission line and find the expressions for the characteristic impedance, attenuation constant and phase propagation constant. Discuss the difference between characteristic impedance and line impedance.

22.

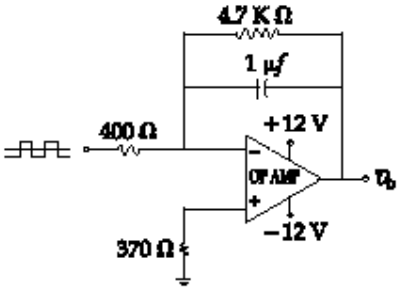

Figure 1

The input signal in the Figure-1 shown above is a square wave of 50Hz alternating between ±12V.

(a) Find the output v_o, waveform shape and amplitude.

(b) Calculate the minimum slew-rate.

23. Explain how a JK flip flop can be converted into a T - flip flop.

24. Write the control words for the following configuration of the parts of Intel 8255 for mode 2 operations.

Part A - bidirectional

mode of Part A - mode 2

Part B - output

mode of Part B - mode 1

25. Explain and derive an expression for the followings with respect to the FM modulator

(a) Modulation index

(b) The voltage distribution in FM wave

(c) The power in modulated FM wave

SECTION - IV

Note : This section consists of one essay type question of forty (40) marks to be answered in about one thousand (1000) words on any of the following topics.

(40x1=40 marks)

26. (a) Explain the operation of the pn-junction diode in the forward and reverse bias conditions. Discuss the effect of doping in the semiconductor.

(b) Find the recification efficiency and ripple factor of a bridge rectifier.

(c) Draw a shunt - voltage regulator circuit and explain its functioning.

(d) Draw a successive approximation type A/D converter circuit and explain its functioning.

OR

(a) Draw a circuit to control the speed of a D.C. series motor using SCR and explain its functioning.

(b) Describe the GUNN effect and explain the operation of GUNN device under quenched mode.

(c) Draw a Wein-bridge oscillator circuit and find its oscillation condition.

(d) Draw a frequency modulator and demodulator circuits and explain its operation.

FOR OFFICE USE ONLY							
Marks Obtained							
Question Number	Marks Obtained	Question Number	Marks Obtained	Question Number	Marks Obtained	Question Number	Marks Obtained
1		26		51		76	
2		27		52		77	
3		28		53		78	
4		29		54		79	
5		30		55		80	
6		31		56		81	
7		32		57		82	
8		33		58		83	
9		34		59		84	
10		35		60		85	
11		36		61		86	
12		37		62		87	
13		38		63		88	
14		39		64		89	
15		40		65		90	
16		41		66		91	
17		42		67		92	
18		43		68		93	
19		44		69		94	
20		45		70		95	
21		46		71		96	
22		47		72		97	
23		48		73		98	
24		49		74		99	
25		50		75		100	

Total Marks Obtained (in words) .....

(in figures) .....

Signature & Name of the Coordinator .....

(Evaluation) Date .....