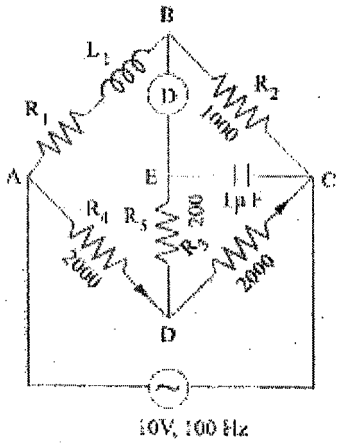
B.E. (Inst. & Electronics Engg.) Examination 2025
Second Year Second Semester
Subject: Measurements and Electronic Instrumentation
Time: 3 hours, Full Marks 100

Group A: 50 Marks

Answer any five questions

1. a) A dual-slope ADC has a fixed integration time of 100 ms. The reference voltage of the ADC is 5 V. Find the time taken by the ADC to measure an input voltage of 1.25 V. 3
   b) What is the significance of '½' digit in a 3½ digit voltmeter? 2
   c) A moving-coil ammeter has a fixed shunt of 0.02 Ω. With a coil resistance of R = 1000 Ω and a potential difference of 500 mV across it, full-scale deflection is obtained. (a) To what shunted current does it correspond? (b) Calculate the value of R to give full-scale deflection when shunted current I is (i) 5 A, and (ii) 25 A, (c) With what value of R, 50% deflection is obtained with I = 100 A. 5

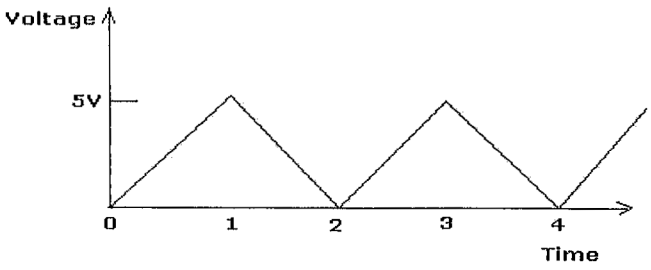
2. The figure below gives the connection of Anderson's bridge for measuring the inductance L1 and resistance R1 of a coil. Find R1 and L1, if balance is obtained when R3 = R4 = 2000 ohms, R2 = 1000 ohms R5=200 ohms and C =1μF. 10



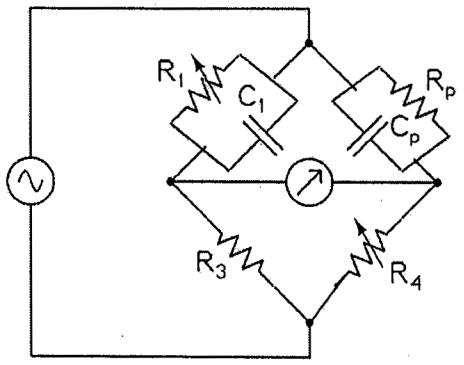
3. The signal as shown in the figure (next page) is applied to the following voltmeters:

   (i) Full-wave rectifying type ac voltmeter, (ii) Peak-response voltmeter, (iii) True RMS voltmeter, iv) DC voltmeter.

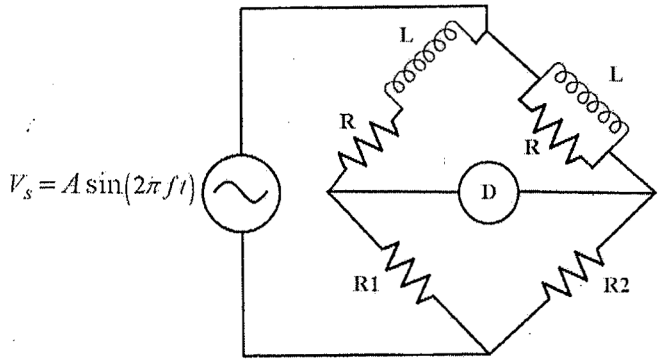
   What would be the reading displayed on each voltmeter and obtain the percentage error with respect to its rms value in each case? 10



4. The parallel resistance-capacitance bridge shown below has a standard capacitance value of C1=0.1μF. The bridge is balanced at a supply frequency of 100 Hz for R1=375 kΩ, R3=10 kΩ and R4=14.7 kΩ. Obtain Rp, Cp and the Dissipation factor of the parallel combination of Rp and Cp. 10



5. Consider an AC bridge shown in the figure with R = 300 Ω R1 = 1000 Ω R2 = 500 Ω L = 30 mH, and a detector D. At the bridge balance condition, find the frequency of the excitation source V_S. 10



6. a) Briefly describe a current transformer (CT). Why the secondary of a CT cannot be kept open 3+2

b) Explain with a diagram the circuit of a linear ohmmeter. 5

Group B: 30 Marks
Answer any three questions

7. a) Explain the principle of operation of a Phase locked loop. How is frequency synthesis done in a DPLL? 3+3

b) a) How is a low resistance measured using a Q meter? 4

8. Explain with a diagram the triggering section of an oscilloscope. State the difference between Normal mode and Auto mode of triggering. 10

9. Derive the transfer function of the equivalent circuit of a 10:1 attenuator probe and an oscilloscope input. Obtain the condition when it becomes an all-pass filter. How is this probe tuned in an oscilloscope? 8+2

10. a) Discuss with a diagram the scheme of measurement of frequency of a signal using direct counting method. 6

b) Two signals with frequency 100 Hz and 10 KHz are to be measured with a frequency meter (in direct counting mode) with the time base error of 1 ppm. Calculate the time base error in each case. 4

Group C: 15 Marks
Answer any three questions

11. i) Why the signal lines are twisted? What are the full forms of UTP and STP in the context of cables? 3

ii) Why a small capacitor is connected between V_{cc} and ground terminals with digital ICs? 2

12. What are the sources of inductively coupled interference signal and what are the methods of elimination? 3+2

13. Discuss the following serial interference standards briefly: 3+1+1

i) RS-232C
ii) RS 422
iii) iii) RS 485

14. Explain with an example the conductively coupled interference. 5

Group D: 5 Marks

16. What is a virtual instrument? Mention the advantages. 5