B.E. Instrumentation and Electronics Engg Fourth Year 1st Semester - 2019
Subject: **Electronic Instrumentation**

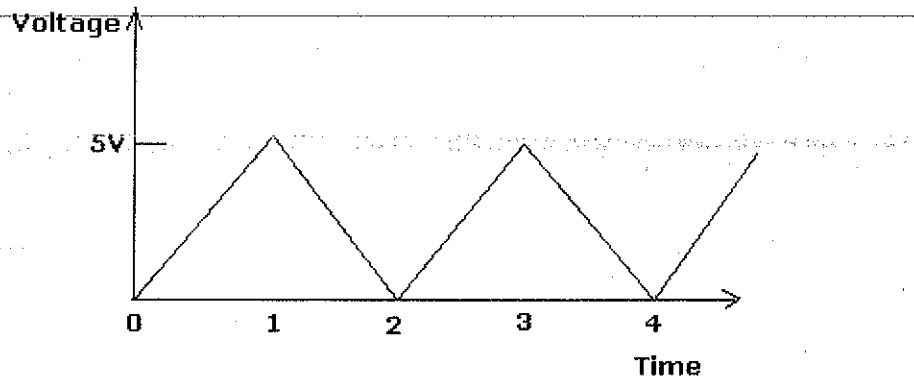
Time: 3 hours Full Marks 100

Group A
Answer any five questions

1. Draw the circuit of a dc electronic voltmeter with an emitter follower and explain the operation. 5

2. Consider a sinusoidal signal with peak-to-peak voltage 12V and frequency 1 KHz. If we measure the signal with a half-wave rectifier type ac electronic voltmeter (non-precision type), what would be the percentage error if the forward diode drop is 0.65 V. 5

3. A triangular waveform as shown in Fig. 1 is applied to the following voltmeters:
   (i) Half-wave rectifying type (precision type) ac voltmeter
   (ii) True rms meter
What would be the reading displayed on each voltmeter and obtain the percentage error in each case? 5



4. Why the input impedance of a voltmeter should be kept high? Draw the different ground symbols used in electronic circuits and explain. Which one is used for electronic voltmeters and why? 2+2+1

5. Draw the circuit of a linear ohmmeter and explain the operation. Why there is an upper limit of the resistance value to be measured? 5

6. Design an attenuator to be used with an electronic voltmeter. The total impedance of the attenuator is 2 MΩ and it will have ranges 1V, 5V, 10V, 100V. The maximum voltage that can be applied to the voltmeter is 1 V. 5

Group B

Answer any five questions

7. In an oscilloscope, explain the triggering mechanism briefly with a block diagram. 5
8. How are the secondary electrons arrested in a CRO? 5
9. In a CRO, how dc shift is implemented with the deflection amplifier? 5
10. What are the different modes of switching in a dual-trace oscilloscope? Explain with waveforms. 5
11. 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. 5
12. What is the function of z-axis modulation input in a CRO? 5

Group C
Answer any five questions

13. Discuss with a diagram the scheme of measurement of frequency of a signal. 5
14. Find the percentage error in direct counting frequency measurement if the input frequency is 1 KHz and the time base error is 1 in 10^6? 5
15. How is the ratio of two frequencies measured with the help of a frequency meter? 5
16. How is low impedance measured using a Q meter? 5
17. i) What is the significance of a '½' digit in a 3½ digit voltmeter? 2
    ii) What would be the display if 104.56 mV is applied in a digital voltmeter when the range is 200 mV? 1
    iii) Which A/D converters are used in digital storage oscilloscopes and why? 2
18. With a schematic/circuit diagram, explain how power line interference is eliminated in digital voltmeters using dual slope A/D converters? 5

Group D
Answer any five questions

19. i) Why twisted pair cables are used to reduce the effect of interference signal? 3
    ii) Why a small capacitor is connected between V_{cc} and ground terminals with digital ICs? 2
20. What are the sources of inductively coupled interference signal? Why the signal lines and power lines are kept perpendicular to each other in a measuring setup? 3+2

21. With the timing diagram of the handshaking signals, explain the data transfer mechanism in the IEEE 488 bus. 5
22. Explain with an example, the function of Link Active scheduler in Foundation fieldbus. 5
23. Mention the features of the HSE and H1 bus in foundation fieldbus. 5
24. What is the difference between baud rate and bps? What are the signal levels for logic 0 and logic 1 in RS232C. Calculate the overhead in data transfer for a typical RS232C data frame. 1+2+2