29/6/Arr.

2025

ELECTRONICS — GENERAL

Paper : DSE-B-1 and DSE-B-2

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

DSE-B-1

(Electronic Instrumentation)

Full Marks : 50

Answer ***question no.*** **1** and ***any four*** questions from the rest.

1. Answer ***any ten*** questions : 1×10

(a) Precision refers to

(i) reproducibility of the measurements

(ii) degree of closeness to the true value

(iii) ratio of output signal to a change of input

(iv) None of the above.

(b) Chassis ground in the instrument is used

(i) for the safety of the instruments (ii) for the safety of the users

(iii) to eliminate faults to ground (iv) All of these.

(c) Error in instruments means

(i) deviation from the true value (ii) unwanted values

(iii) random and unexpected values (iv) All of these.

(d) 220V AC supply refers to

(i) Average value (ii) RMS value

(iii) Peak to peak value (iv) None of these.

(e) Performance of Hay's bridge and Maxwell's bridge are identical when

(i) Q factor = 0 (ii) Q factor = 1

(iii) Q factor > 10 (iv) Q factor < 10.

(f) CRO is used to measure

(i) amplitude of a signal (ii) frequency of a signal

(iii) phase of a signal (iv) All of these.

(g) Brightness of the spot on the CRT screen is controlled

(i) by changing the grid voltage

(ii) by changing the focusing anode voltage

(iii) by applying –ve voltage in the vertical deflection plates

(iv) None of the above.

(h) For normal signal display, in the horizontal deflection plates of a CRO

(i) a sinusoidal signal is applied (ii) a sawtooth wave signal is applied

(iii) a DC voltage is applied (iv) None of these.

(i) Photo-voltaic devices convert

(i) mechanical energy to thermal energy (ii) thermal energy to electrical energy

(iii) electrical energy to thermal energy (iv) photon energy to electrical energy.

(j) Solar cell is a/an

(i) active transducer (ii) passive transducer

(iii) thermoelectric device (iv) None of these.

(k) What does the T wave represents in ECG?

(i) atrial diastole (ii) atrial systole

(iii) ventricular diastole (iv) joint diastole.

(l) Which of the following abilities can Arduino have?

(i) levitate (ii) regenerator

(iii) intimidate (iv) drizzle.

2. (a) What are sensitivity and accuracy of an instrument?

(b) What is significant figures and how it is related to precision of an instrument?

(c) What is resolution? (2+2)+(2+2)+2

3. (a) Design an Ammeter capable of measuring current in the range of 0-20 mA by using a Galvanometer with coil resistance of 50Ω and current for full scale deflection (I_m) of 500 μA.

(b) Why voltmeter is connected in parallel and ammeter in series during measurements?

(c) Compare series and shunt type Ohmmeters. 5+2+3

4. (a) Draw the circuit diagram of a Maxwell's inductance-capacitance bridge.

(b) Derive the equations for balance for Maxwell's inductance-capacitance bridge.

(c) How self inductance of a coil can be measured using a Maxwell's inductance-capacitance bridge?

(d) What are the advantages of Anderson Bridge over Maxwell's bridge? 2+4+2+2

5. (a) Draw the block diagram of a general purpose CRO and explain briefly.

(b) How frequency of sinusoidal signal can be measured using a CRO?

(c) What is dual beam CRO? 5+3+2

6. (a) What is the function of aquadag in CRT?

(b) What is the function of focusing anode in CRT?

(c) Compare electrostatic and magnetic deflections.

(d) How a sinusoidal signal can be displayed using a CRO? 2+2+2+4

7. (a) What is duty cycle?

(b) Draw the block diagram of a function generator.

(c) Draw the circuit diagram of a square wave generator and explain its operation. 2+3+5

8. (a) Compare active and passive transducers.

(b) Explain with diagram the working principle of an inductive transducer.

(c) Compare Arduino Uno and Nano. 2+5+3

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(2235+2236)

DSE-B-2

(Transmission Lines, Antenna and Radio Wave Propagation)

Full Marks : 50

Answer ***question no.*** **1** and ***any four*** questions from the rest.

1. Answer ***any ten*** questions : 1×10

(a) The example of sky wave communication is

(i) FM Radio (ii) AM Radio

(iii) CB Radio (iv) Microwave.

(b) At the point of discontinuity, _____ component of magnetic flux density is continuous

(i) tangential (ii) normal

(iii) None of these (iv) Both.

(c) Find the output impedance of a transmission line having a voltage of 36V and a conduction current of 1.8A is

(i) 64.8 KΩ (ii) 20Ω

(iii) 20KΩ (iv) None of these.

(d) When analysing a transmission line, its inductance and capacitance are considered to be

(i) lumped (ii) distributed

(iii) equal reactance (iv) ideal elements.

(e) Which antenna consists of two straight collinear conductors of equal length, separated by small gap?

(i) half-wave dipole (ii) horizontal-quarter wave dipole

(iii) vertical-quarter wave dipole (iv) folded dipole.

(f) An air-filled rectangular waveguide has dimensions of 6×4 cm. Its cut-off frequency for the TE10 mode is

(i) 2.5 GHz (ii) 25 GHz

(iii) 5 GHz (iv) 25 MHz.

(g) For a dielectric which of the following statement is correct?

(i) They are superconductors at high temperatures

(ii) They are superconductors at low temperatures

(iii) They can never become a superconductor

(iv) They have very less dielectric breakdown voltage.

(h) The energy transported by the fields per unit time per unit are is called _____.

(i) Poynting energy (ii) Electro-magnetic energy

(iii) Poynting vector (iv) Flux density.

(i) What is the wavelength of Super high frequency (SHF) especially used in Radar & Satellite communication?

(i) 1cm-10cm (ii) 1m-10m

(iii) 0.1cm-1cm (iv) None of these.

(j) Which frequency is used for ground wave propagation?

(i) 2MHz (ii) 2GHz

(iii) 30MHz (iv) 30GHz.

(k) The guided wavelength and the phase constant are related by

(i) $2\pi/\beta g = \lambda g$ (ii) $1/\beta g = \lambda g$

(iii) $1/2\pi\beta g = \lambda g$ (iv) $\beta g = \lambda g$.

(l) The energy transported by the fields per unit time per unit area is called

(i) Poynting vector (ii) Poynting energy

(iii) Flux density (iv) None of these.

2. (a) Explain the following terms with respect to antenna.

(i) Directivity

(ii) Radiation intensity.

(b) Explain the operation of Rhombic antenna. (3+3)+4

3. (a) What are the characteristics of electromagnetic wave?

(b) What are the factors that affect the propagation of radio waves?

(c) Define line of sight and critical angle of radio wave propagation. 4+3+3

4. (a) What are the applications of Transmission line?

(b) Differentiate between short circuited and open circuited transmission lines.

(c) What is characteristic impedance? Mention its significance. 4+3+3

5. (a) What are degenerate modes in a rectangular waveguide?

(b) If a wave with frequency of 200MHz propagates in free space, find the propagation constant.

(c) What are guided waves? Give examples. 3+4+3

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6. (a) Explain the term (i) Phase velocity and (ii) group velocity.

(b) What is duct propagation?

(c) Explain MUF. Mention its importance. (2+2)+2+(2+2)

7. (a) What is antenna? Draw the radiation pattern of antenna.

(b) Define different types of apertures of an antenna.

(c) What do you mean by bandwidth of antenna? (2+3)+3+2

8. Write short notes (***any two***) : 5×2

(a) Polarisation of electromagnetic wave

(b) VSWR

(c) Virtual height

(d) Folded dipole Antenna.
