G 1094 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering/Information Technology/Applied Electronics and Instrumentation Engineering/Electronics and Instrumentation Engineering

DIGITAL SIGNAL PROCESSING (L, T, A, S)

(Old Scheme—Prior to 2010 Admissions)

[Mercy Chance]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 4 *marks.*

1. Discuss signal flow graph with an example.
2. Distinguish between Butterworth and Chebyshev filters.
3. Define linear phase FIR filters. Can IIR filters have linear phase ?
4. What are zeros ? Discuss the analysis of systems based on zeros.
5. State and prove linearity property of DFT.
6. Discuss the advantages of computation of DFT using FFT as compared to direct computation.
7. What are the different representations of fixed point numbers ?
8. What do you understand by zero input limit cycle oscillations ?
9. How is digital signal processing used in RADAR ?
10. What is a channel vocoder ? Discuss the advantages and applications.

(10 × 4 = 40 marks)

Part B

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Realize the following IIR filters using (i) Cascade form ; (ii) Parallel form :

$$h(z) = \frac{0.7 - 0.252\ z^{-2}}{1 + 0.1z^{-1} - 0.72z^{-2}}.$$

(6 + 6 = 12 marks)

Or

Turn over

12. Convert the following analog IIR filter to digital IIR filter using (i) Approximation of derivatives ; (ii) Impulse invariance transformation :

$$H_a(s) = \frac{s+0.2}{(s+0.2)^2+9}.$$

(6 + 6 = 12 marks)

13. Realize the following IIR filters using (i) cascade form ; (ii) Lattice form :

$$H(z) = 1 + 2.88z^{-1} + 3.4048z^{-2} + 1.74z^{-3} + 0.4z^{-4}.$$

Or

14. A LPF is to be designed with the following desired frequency response :

$$H_d(e^{jw}) = \begin{cases} e^{-j2w}, & -\pi/4 \le w \le \pi/4 \\ 0, & \pi/4 < |w| \le \pi \end{cases}$$

Determine the filter coefficients $h_d(n)$ if the rectangular window is used. Also determine the frequency response $H(e^{jw})$ of the desired filter.

15. Obtain the linear convolution of the following signals $x(n) = \{4, -2, 1\}$ and $y(n) = \begin{cases} 1, & 0 \le n \le 5 \\ 0, & \text{otherwise.} \end{cases}$

Or

16. Determine the DFT of the following signal using DIF - FFT algorithm : $x(n) = 2^n$ and N = 8.

17. Explain the quantization effects in the computation of DFT.

Or

18. Discuss the effects of round-off in digital filters.

19. Explain sub-band coding of speech signals with a neat block diagram.

Or

20. Explain homomorphic vocoder with a neat block diagram.

[5 × 12 = 60 marks]

G 1860 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering

EC 010 601—DIGITAL COMMUNICATION TECHNIQUES (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. State the properties of autocorrelation function.
2. What is meant by correlation receiver ?
3. What is meant by slope overload distortion ? Explain.
4. Explain the significance of eye diagram.
5. What is meant by coherent detection ? Explain.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Determine the probability that the Gaussian random variable X lies in the interval $(m_x - K\sigma_x) < (Xm_x + K\sigma_x)$, where $x = 3$.

7. A finite energy signal S (t) is defined as $S(t) = \begin{cases} A, & 0 \le t \le T \\ 0, & \text{otherwise.} \end{cases}$ Determine the spectrum of the output of the filter matched to S (t).

8. Find the output signal-to-noise ratio in a delta modulated system for a 1 kHz sinusoid, which is sampled without slope overload. The bandwith of the reconstruction filter used is 4 kHz.

9. What is equalisation ? What are its types ? Explain.

10. Given the binary data 1100110000. Represent in ASK and PSK.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Consider a sinusoidal signal with random phase, defined by $X(t) = A\cos(2\pi f_c t + \theta)$ where A and f_c are constants and θ is random variable and $f_\theta(\theta) = \begin{cases} \pi/2, & -\pi \le \theta \le \pi \\ 0, & \text{elsewhere.} \end{cases}$ Find the autocorrelation function.

Or

12. Define and explain the following :
    (i) Random process.
    (ii) Ensemble average.
    (iii) Stationary process.
    (iv) Ergodic process.
    (v) Cross spectral density.
    (vi) Gram-Schmidt orthogonalization procedure.

13. (a) A binary data is transmitted using ASK over an AWGN channel at a rate 2.4 MBPS. The carrier amplitude at the receiver is 1 mV. Noise power spectral density $\frac{N_0}{2} = 10^{-15}$ W/Hz. If *erfc* (5) = 3×10^{-6}, find the average probability of error.
    (b) What is a matched filter receiver ? Explain its working.

Or

14. Draw and explain the block diagram of correlation receiver. Derive the expression for the response of bank of correlation receiver to noisy input.

15. The bandwidth of signal input to the PCM is restricted to 4 kHz. The input varies from – 3.8 V to + 3.8 V and has the average power 30 mW. The required SNR is 20 dB. The modulator produces binary output, with uniform quantization.
    (i) Calculate the number of bits required per sample.
    (ii) The outputs of 30 such PCM coders are time multiplexed. What is the minimum required transmission bandwidth for the multiplexed signal ?

Or

16. (a) What is quantization ? Explain, with necessary waveforms, two types of quantization.
    (b) With neat block diagram, explain the principle of DPCM modulator and demodulator.

17. With neat block diagram of base band communication system, explain ISI. Also discuss Nyquist criterion for distortionless base band binary transmission.

Or

18. (a) The binary data 0010110 are applied to the input of a duobinary system. Construct the duobinary coder output and corresponding receiver output with a precoder.
    (b) Explain adaptive equalisation and its needs.

19. Explain BPSK. Derive the power spectral density of a BPSK signal. What are its bandwidth requirements ?

Or

20. Draw and explain the block diagram of M-ary QAM transmitter and receiver. Also explain the signal space diagram.

(5 × 12 = 60 marks)

G 1866 (Pages : 4) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Applied Electronics and Instrumentation/Electronics and Communication/ Electronics and Instrumentation Engineering

AI 010 602/EC 010 602/EI 010 602—DIGITAL SIGNAL PROCESSING (AI, EC, EI)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *the questions.*
Each question carries 3 *marks.*

1. Give an account on the existence and symmetric properties of DTFT.
2. Comment on the importance of frequency response of a single zero and pole.
3. Draw the direct form implementation of the FIR system having difference equation :

$$y(n) = x(n) - 2x(n-1) + 3x(n-2) - 10x(n-6).$$

4. Why the Butterworth response is called a maximally flat response ?
5. How will you perform linear convolution using circular convolution ?

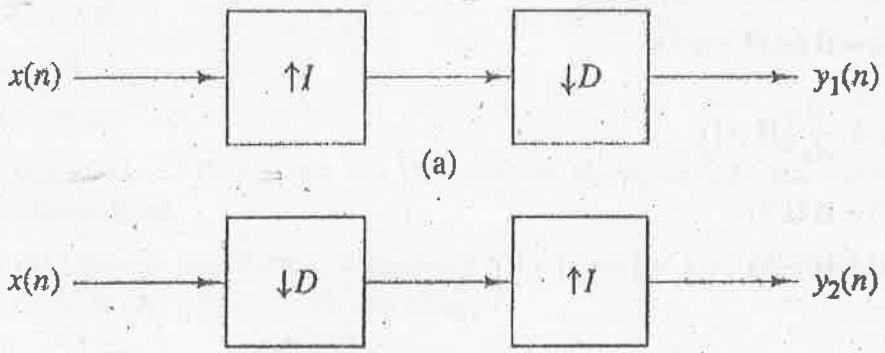
(5 × 3 = 15 marks)

Part B

Answer **all** *the questions.*
Each question carries 5 *marks.*

6. (a) If D = I, Show that the outputs of the two cascade configurations are different.

   (b) Show that the two configurations are identical if and only if D and I are relatively prime.



Turn over

7. A discrete-time causal LTI system has the system function :

$$H(z) = \frac{\left(1 + 0.2z^{-1}\right)\left(1 - 9z^{-2}\right)}{\left(1 + 0.81z^{-2}\right)}$$

(a) Is the system stable ?

(b) Find the expressions for a minimum-phase system $H_1(z)$ and an all-pass system $H_{ap}(z)$ such that $H(z) = H_1(z)\, H_{ap}(z)$.

8. Enumerate the structures for linear phase systems.

9. Explain the design procedure of FIR filters using Kaiser windows ?

10. Find the 10-point DFT of the sequence $x(n) = \cos\left(\frac{3\pi}{5} n\right) \sin\left(\frac{4\pi}{5} n\right)$.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) State and prove Parseval's relation in DTFT.

(b) Obtain the DTFT sequence of $y[n] = n\alpha^n\, u[n], |\alpha| < 1$.

(6 + 6 = 12 marks)

Or

12. Explain sampling rate conversion by a decimator factor and derive input and output relation in both time and frequency domain.

13. The system function of a discrete-time linear shift-invariant system is $H(z)$. Assume that $H(z)$ is a rational function of z and that $H(z)$ is causal and stable. Determine which of the following systems are stable and which are causal :

(a) $G(z) = H(z)\, H^*(z^*)$.

(b) $G(z) = \frac{d}{dz}[H(z)]$.

(c) $G(z) = H(z^{-1})$.

(d) $G(z) = H(-z)$.

Or

14. The relationship between the input and the output of an FIR system is as follows :

$$y(n) = \sum_{k=0}^{N} b(k)\, x(n-k).$$

Find the co-efficients $b(k)$ of the smallest-order filter that satisfies the following conditions :

(a) The filter has (generalized) linear phase.

(b) It completely rejects a sinusoid of frequency $\omega_0 = \frac{\pi}{3}$.

(c) The magnitude of the frequency response is equal to 1 at $\omega = 0$ and $\omega = \pi$.

15. Consider the causal linear shift-invariant filter with system function :

$$H(z) = \frac{1 + 0.875z^{-1}}{\left(1 + 0.2z^{-1} + 0.9z^{-2}\right)\left(1 - 0.7z^{-1}\right)}.$$

Draw a signal flowgraph for this system using :

(a) Direct form I.

(b) Direct form II.

(c) A cascade of first- and second-order systems realized in transposed direct form II.

(d) A parallel connection of first- and second-order systems realized in direct form II.

(3 + 3 + 3 + 3 = 12 marks)

Or

16. A linear shift-invariant system has a unit sample response given by :

$h(0) = -0.01$

$h(1) = 0.02$

$h(2) = -0.10$

$h(3) = 0.40$

$h(4) = -0.10$

$h(5) = 0.02$

$h(6) = -0.01$

(a) Draw a signal flowgraph for this system that requires the minimum number of multiplications.

(b) If the input to this system is bounded with $|x(n)| < 1$ for all n, what is the maximum value that the output, $y(n)$, can attain ?

(6 + 6 = 12 marks)

Turn over

17. Determine the system function H (z) of the Chebyshev low pass digital filter with the specifications.

    (a) α_p = 1 dB ripple in the pass band $0 \leq \omega \leq 0.2\,\pi$.

    (b) α_s = 1 dB ripple in the stop band $0.3\,\pi \leq \omega \leq \pi$.

    Using bilinear transformation (assume T = 1 sec.).

Or

18. Using a rectangular window technique, design a low pass filter with pass band gain of unity cut off frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7.

19. (a) Derive the butterfly diagram of 8 point radix – 2 DIF FFT algorithm and fully label it.

    (b) Compute the DFT of $x\,(n) = \{1, 1, 0, 0\}$.

(8 + 4 = 12 marks)

Or

20. (a) Prove that FFT algorithms help in reducing the number of computations involved in DFT computation.

    (b) Compute the linear convolution of finite duration sequences :

    $h\,(n) = \{1, 2\}$ and $x\,(n) = \{1, 2, -1, 2, 3, -2, -3, -1, 1, 1, 2, -1\}$ by Overlap add method ?

(4 + 8 = 12 marks)

[5 × 12 = 60 marks]

G 1884 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering

EC 010 603—RADIATION AND PROPAGATION (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define effective aperture of an antenna.
2. Compare the performance of binomial array with uniform array of same number of elements.
3. What are the functions of embedded antennas ?
4. Derive the expression for effective refractive index for ionospheric propagation.
5. Define LOS distance.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain polarization.
7. Briefly explain Dolph-Chebyshev arrays.
8. Explain plasma antenna.
9. Derive the expression for maximum usable frequency for ionospheric propagation.
10. Explain diversity reception.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Explain the concept of retarded potential.

    (b) Distinguish between ohmic resistance and radiation resistance of an antenna.

Or

Turn over

12. Explain the following terms (a) directive gain ; (b) antenna efficiency ; (c) antenna beam area ; (d) effective height of an antenna.

13. Explain broadside array and derive array factor, positions of nulls, positions of major lobes and HPBW of broadside array.

Or

14. Explain (a) Phased arrays ; (b) Smart antennas.

15. Explain the principle and operation of log periodic antenna with neat diagrams.

Or

16. Write a note on (a) Yagi uda antenna ; (b) Horn antenna.

17. Explain (a) duct propagation ; (b) magneto ionic splitting.

Or

18. (a) Derive expression for range of space wave propagation.

(b) Explain structure of ionosphere.

19. Explain measurement procedure of directional pattern with sufficient diagrams.

Or

20. Explain process of measurement of gain with neat diagrams.

(5 × 12 = 60 marks)

G 1898 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering

EC 010 604—COMPUTER ARCHITECTURE AND PARALLEL PROCESING (EC)

(2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. What are the differences between linker and loader ?
2. Define bus. What are the different types ?
3. Describe the memory hiearchy.
4. What are the benefits achieved by clustering ?
5. What is hyperthreading ? Explain.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. How does a multiprocessor machine differ from a multicomputer machine ? Give one example of each.
7. Explain control sequence of an unconditional branch instruction.
8. Explain the structure of memory hierarchy with the help of a diagram.
9. Explain the practical issues for interconnection network.
10. Explain the principle of data storage and retrieval form a BLURAY Disc.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Explain the parallel processing mechanisms for uniprocessor systems. Compare their performances.

Or

Turn over

12. (a) What are the various types of dependencies to be considered in instruction level parallelism ? Explain. (7 marks)

(b) What are addressing modes ? Explain any *four* types. (5 marks)

13. Explain the various steps involved in the design of hardwired control logic with the help of an example.

Or

14. Multiply the following pair of signed 2's complement numbers using Booth algorithm A = 101001 (multiplicand), B = 110011 (mutiplier).

15. (a) What is the need of cache replacement algorithms ? Explain LRU replacement algorithm. (7 marks)

(b) Showing the possible register configurations in a DMA interface, explain direct memory access. (5 marks)

Or

16. (a) Explain static and dynamic RAM calls and their working. (6 marks)

(b) State and explain three techniques to increase the bus bandwidth. (6 marks)

17. (a) What are control hazards ? Explain various techniques which can be used to resolve it. (7 marks)

(b) Explain Flynn's classification of computer architecture. (5 marks)

Or

18. (a) Differentiate between a centralised memory multiprocessor and a distributed memory multiprocessor system. (6 marks)

(b) Explain thread level parallelism and multithreading. (6 marks)

19. Discuss the evolution of dual core processor in Pentium and how it improves the performance.

Or

20. With neat diagrams and waveforms, explain the principle of SMPS. Show the different connectors associated with it.

[5 × 12 = 60 marks]

G 1913 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering

EC 010 605—MICROCONTROLLERS AND APPLICATIONS (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Explain the use of the following pins of 8051 :

   (i) TXD ; (ii) $\overline{PSEN}$; (iii) To.

2. State the addressing modes used in each of the following instructions :

   (i) ANL 41H, # 20 H.

   (ii) ORL 33H, # 33 H.

   (iii) MOVX @ DPTR, A.

3. Explain the IE register.

4. Explain the working of a stepper motor.

5. What are the differences between PIC machine cycle in comparison with 80C51 ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Explain the configuration of various ports of 80C51.

7. Explain the register banks and how it can be switched during program execution in 8051.

8. Explain the different interrupt signals available in 8051 and also give their priority levels.

9. Write an Assembly Language Program to glow an LED connected to port 1 when a switch connected to prot 2 is depressed.

10. How do the PIC microcontrollers support the power saving options ? Explain.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. (a) Explain Boolean and program branching instruction set of 8051.

    (b) Write an Assembly Language Program to check whether a given number is odd or even.

Or

12. (a) Explain bit level and byte level logical operations of 8051.

    (b) With a program example, show how can a string be defined in the assembly language program of 8051.

13. Explain the following with reference to 8051 :

    (i) Software time delay generation.

    (ii) Software polled time.

    (iii) Hardware time delay.

Or

14. Write an Assembly Language Program to find the smallest number out of 50 numbers stored in the external memory starting from 5000H onwards.

15. Write an ALP to generate a 750 Hz square wave using timer 1 of 8051. Show how the frequency of the square wave can be changed to 3 kHz. Assume f_{ose} = 6 MHz.

Or

16. Draw a circuit diagram to show how two 8051 are to be connected with serial communication between them. Explain how the peripherals are used.

17. Explain the features of ADC 0804 and show how it can be interfaced with 8051.

Or

18. Draw the circuit diagram to interface a relay to 8051, which can be used to glow an incandescent lamp at 230 V for a period of 10 seconds ON, 20 seconds OFF. Also write the ALP.

19. With neat diagrams, describe the memory organisation of PIC 18 series.

Or

20. Describe the various registers in PIC 18 and their special features.

(5 × 12 = 60 marks)

G 1948 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering

EC 010 606 L04—MEDICAL ELECTRONICS (Elective I) [EC]

(New Scheme—2010 Admission onwards)

[Supplementary/Improvement]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Explain about surface electrodes.
2. Define cardiac output and cardiac rate.
3. Explain the role of pre-amplifiers in bio potential measurements.
4. Give the significance of input guarding.
5. Briefly explain the role of detectors in imaging techniques.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. With the help of a neat schematic, explain the structure of a neuron and explain how potentials are propagated through neurons ?
7. What is fibrillation ? Explain different waveforms used in defibrillators.
8. Explain single channel telemetry system.
9. Briefly explain how blood PH can be measured ?
10. Discuss MR imaging and its advantages.

(5 × 5 = 25 marks)

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Explain the following :
    (a) PH electrode. (6 marks)
    (b) Ag-AgCl electrode. (6 marks)

Or

12. Explain :

(a) Cardiac system. (6 marks)

(b) Respiratory system. (6 marks)

13. Explain two indirect methods used for the measurement of blood pressure.

Or

14. Explain :

(a) Demand type cardiac pacemaker. (6 marks)

(b) Bipolar ECG lead system. (6 marks)

15. Explain :

(a) Bed side monitor. (8 marks)

(b) Lead fault indicator. (4 marks)

Or

16. Explain :

(a) 10 – 20 electrode system. (5 marks)

(b) Telemetry system. (7 marks)

17. Explain :

(a) Chopper stabilized amplifiers. (6 marks)

(b) Isolation amplifiers. (6 marks)

Or

18. Explain any *one* method to measure blood PH and respiratory volume.

19. Discuss X-ray imaging technology. Give its advantages and disadvantages.

Or

20. Explain :

(a) CT imaging. (6 marks)

(b) MR imaging. (6 marks)

[5 × 12 = 60 marks]

G 1950 (Pages : 2) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2018

Sixth Semester

Branch : Electronics and Communication Engineering

EC 010 606 L06—TELEVISION AND RADAR ENGINEERING (Elective I) [EC]

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*

Each question carries 3 *marks.*

1. What is the role of AGC in Television receiver circuits.
2. List three major differences between PAL and NTSC color TV systems.
3. What is meant by a Geo-stationery satellite.
4. Briefly explain the theory of Doppler effect employed in RADAR.
5. Compare Klystron and TWT amplifiers based on the principle of operation.

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*

Each question carries 5 *marks.*

6. Draw and explain a composite video signal. Clearly indicate different components.
7. Explain the principle of PAL-D demodulation with necessary diagram showing the summation of line phasors.
8. Describe the different signal processing steps involved in plasma and LCD TV receivers
9. Explain a CW RADAR with block diagram. Also show the response characteristics of beat frequency amplifier.
10. Narrate on the principle of parabolic reflector antenna used in RADAR systems.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries 12 *marks.*

11. Draw the block diagram of a monochrome TV receiver and explain

Or

12. Explain the role of IF amplifier section in monochrome TV receiver. Discuss on the choice of intermediate frequencies. What is meant by vestigial sideband correction ?

13. Explain how luminance and chrominance signals are generated in color TV camera. What is the need of color difference signals ? With neat diagram explain color burst signal.

Or

14. Explain the principle of SECAM color TV system. Describe SECAM coder and decoder. Give the merits and demerits.

15. Describe the requirements for digitization of video signal .Explain digitization techniques. Also mention the standards and specifications.

Or

16. Explain LCD and plasma screen receivers with clear explanation of technologies

17. What is the principle of MTI Radar ? Compare with simple CW Radar. Explain the role of delay line canceller with block diagram. Also obtain the frequency response of the single delay-line canceller.

Or

18. Explain the following in detail :

    (a) Non-coherent MTI Radar.

    (b) Pulse Doppler Radar

    Also mention the compensation for clutter Doppler shift and clutter Doppler spread.

19. Explain the concept of the electronically steered phased array antenna ii radar. Also describe :

    (a) Radiation pattern with N-element linear array.

    (b) Beam steering.

    (c) Change of beam width with steering angle.

Or

20. Show the diagrammatic representation of the traveling-wave tube and explain. Also describe the role of duplexers in Radar with proper diagram.

(5 × 12 = 60 marks)