Reg. No.	R	A	2	0	1	1	0	0	4	0	1	0	0	5	1

B.Tech. DEGREE EXAMINATION, MAY 2024

Sixth & Eighth Semester

18ECE221T – RADAR AND NAVIGATIONAL AIDS

(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours | Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. Radar operating in ku band will have the bandwidth (A) 8-12 GHz (B) 12-18 GHz (C) 1-2 GHz (D) 4-8 GHz	1	1	1	1
2. A model that can be used for detection of complex targets (A) Fresnel (B) Hauffman (C) Swirling (D) Sipmen	1	1	1	1
3. The range of the target (in 10^8m) if the time period is 5 seconds (A) 7.5 (B) 0.75 (C) 0.075 (D) 150	1	2	1	2
4. A radar operates at a peak power of 500 kW and has duty cycle of 0.01. Its average power is (A) 50 kW (B) 500 kW (C) 5000 kW (D) 0.5 kW	1	2	1	1
5. The pulse repetition frequency of an MTI radar operating at F=10 GHz. Showing the lowest blind speed of 20 m/s is (A) 1.43 kHz (B) 1.33 kHz (C) 3.33 kHz (D) 2.33 kHz	1	2	2	2
6. MTI radar means _____ (A) Moving target indicator (B) Mono target indicator (C) Mono target interval (D) Moving target intrigator	1	2	2	1
7. A radar operates at 104 Hz with PRF 3000 PPS. The lowest blind speed will be (in kM/hr) (A) 40 (B) 66 (C) 81 (D) 162	1	2	2	1
8. From the following, identify over time which produces butterfly effect (A) Fixed targets (B) PPI scope (C) Moving targets (D) Phased detectors	1	1	2	1

9. Matched filter is used in radar to improve 1 1 3 1
   (A) Signal to noise ratio (SNR) (B) Gain
   (C) Power (D) Clutter margin

10. Maximum value of the ambiguity diagram is 1 2 3 1
   (A) $4E^2$ (B) $2E^2$
   (C) $2E^4$ (D) $4E^4$

11. If the received SNR is increased by a factor 16, the root mean square value of the range error would 1 1 3 1
   (A) Increase by 2 (B) Reduce by 4
   (C) Reduce by 2 (D) Increase by 4

12. The procedure by which observing fewer pulses and making a decision in target prediction 1 1 3 1
   (A) Weiner observer (B) Weyman-Pearson observer
   (C) Statistical observer (D) Sequential observer

13. In a receiver, noise is usually developed ay _____stage. 1 1 4 1
   (A) Audio (B) Video
   (C) RF (D) IF

14. First stage of radar receiver is 1 1 4 1
   (A) LNA (B) Mixer
   (C) Local oscillator (D) Matched filter

15. Microwave M type tube is a 1 1 4 1
   (A) Klystron (B) TWT
   (C) Magnetron (D) BWA

16. Silicon Bipolar transistor are used less than 1 1 4 1
   (A) 4 GHz (B) 8 GHz
   (C) 34 GHz (D) 5 GHz

17. _____antenna is used for direction finding at low and medium frequencies. 1 1 5 1
   (A) Horn (B) Patch
   (C) Loop (D) Slot

18. The marker beacons operate at a frequency of 1 1 5 1
   (A) 10 MHz (B) 75 MHz
   (C) 20 MHz (D) 10 MHz

19. _____is designed to eliminate polarization errors. 1 2 5 1
   (A) Radio compass (B) Polarization
   (C) Ad cock (D) Servo motor

20. DECCA system operates in 1 2 5 1
   (A) LF band (B) HF band
   (C) VHF band (D) VHF band

PART – B (5 × 4 = 20 Marks)

Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	Brief the importance of duplexer in a radar system.	4	1	1	1
22.	"Blind speeds are a serious limitation in MTI radar". What should a radar engineer do in the radar design to reduce its effects?	4	3	2	1
23.	Enumerate the process involved in automatic detection.	4	3	3	1
24.	The noise figure of the individual stages of a two stage amplifier is 2.03 and 1.54. The available power gain of the first stage is 62. Find the overall noise figure.	4	4	4	2
25.	Write short notes on Loran C.	4	2	5	1
26.	The unambiguous range of radar is 200 km. It has a bandwidth of 1 MHz. Find the required pulse repetition frequency and time.	4	2	2	2
27.	A radar wavelength and dimension of the target are the important parameters to predict simple targets. Draw a region diagram for the same.	4	1	1	1

PART – C (5 × 12 = 60 Marks)

Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.	As a radar communication engineer, predict the range of the objects by deducing the expression in terms of pure transmitting gain (G) component.	12	4	1	2
	(OR)				
b.	Discuss the effects of various system losses present in a radar system.	12	4	1	1
29. a.	With neat block diagram, explain the different types of delay line cancellers.	12	3	2	1
	(OR)				
b.	Deduce an expression for Doppler's frequency and elaborate on the 'Receding' and 'moving close' targets.	12	4	2	2
30. a.	Derive the surface clutter radar range equation.	12	3	3	1
	(OR)				
b.	Discuss on the significance of Constant False Alarm Rate (CFAR) receiver with a neat diagram.	12	2	3	4
31. a.	Explain reflex klystron in detail, how the high power signals are generated.	12	3	4	1
	(OR)				
b.	Draw and discuss the importance of superheterodyne receiver in a radar system.	12	3	4	1

32. a. Describe the operation of instrument landing system (ILS). 12 3 5 1

(OR)

b. Explain the operation of GPS systems. 12 3 5 1

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