Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

Date: 09- 12-2025 **Time:** 01:00pm – 04:00pm

School: SOE	**Program:** B.Tech	
Course Code: ECE3057	**Course Name:** Radar Engineering	
Semester: VII	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	20	20	20	20	20

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	What are the operational capabilities of RADAR systems?	**2 Marks**	**L2**	**CO1**
2.	What limitations does RADAR technology exhibit?	**2 Marks**	**L2**	**CO1**
3.	What is the difference between continuous wave (CW) radar and pulsed radar? Give one advantage of each type.	**2 Marks**	**L2**	**CO1**
4.	What is the maximum unambiguous range? How is it related with pulse repetition rate?	**2 Marks**	**L2**	**CO5**
5.	Explain the difference between pulse interval and PRF?	**2 Marks**	**L3**	**CO5**
6.	Explain what is meant by "radar cross section" (RCS) of a target. How does it affect radar detection?	**2 Marks**	**L3**	**CO1**
7.	What are the factors affecting the RADAR range?	**2 Marks**	**L3**	**CO5**
8.	Mention two applications and two drawbacks of continuous wave (CW) radar.	**2 Marks**	**L4**	**CO5**
9.	What differentiates MTI radar from pulse Doppler radar?	**2 Marks**	**L4**	**CO1**
10.	What is the effect of receiver bandwidth over the performance of radar?	**2 Marks**	**L4**	**CO5**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Present a fundamental block diagram schematic of a radar subsystem, explicitly delineating its constituent elements.	**10 Marks**	**L2**	**CO1**
	b.	Analyze the functional mechanism of continuous wave (CW) radar, incorporating relevant schematic illustrations and corresponding equations.	**10 Marks**	**L2**	**CO2**
Or					
12.	**a.**	Elucidate the operational principles of a pulsed Doppler radar system through appropriate diagrammatic representations and mathematical formulations.	**10 Marks**	**L2**	**CO1**
	b.	Present a detailed analysis of the operational characteristics of MTI radar, accompanied by relevant schematic diagrams and governing equations.	**10 Marks**	**L2**	**CO2**

13.	**a.**	Examine the various radar frequency bands and their respective applications.	**10 Marks**	**L2**	**CO2**
	b.	Utilizing a hierarchical tree diagram or alternative methodology, present a systematic classification of radar systems.	**10 Marks**	**L3**	**CO3**
Or					
14.	**a.**	Present a basic block-level representation of a tracking radar system architecture.	**10 Marks**	**L2**	**CO2**
	b.	Present a brief analysis of the impact of wireless propagation effects on radar system performance.	**10 Marks**	**L3**	**CO3**

15.	**a.**	Give a brief discussion on the antenna arrays used in RADAR systems.	**10 Marks**	**L3**	**CO3**
	b.	Provide a concise explanation of the operational principles of radar receivers.	**10 Marks**	**L4**	**CO4**
Or					
16.	**a.**	What constitutes MIMO radar technology? Elucidate briefly the underlying operational mechanism and associated applications.	**10 Marks**	**L3**	**CO3**
	b.	Provide a concise explanation of the operational principles underlying Synthetic Aperture Radar (SAR).	**10 Marks**	**L4**	**CO4**

17.	**a.**	Elucidate the diversity techniques employed in radar communication systems for fading mitigation. Discuss the methodologies of spatial diversity, temporal diversity, and frequency diversity.	**10 Marks**	**L2**	**CO4**
	b.	A radar antenna array has a gain of about 27 dBi. mounted on a tall tower and operating at frequencies around 6 GHz. Assuming the minimum acceptable receive power is -120 dBm and the required range is 30 km, what is the minimum acceptable transmitted power?	**10 Marks**	**L4**	**CO5**
		Or			
18.	**a.**	Derive the radar range equation and find the maximum range of the target that can be detected with the minimum detectable power S_{min}.	**10 Marks**	**L2**	**CO4**
	b.	Calculate the maximum range of Radar for the following specifications – Peak power transmitted by the Radar, Pt = 250KW Gain of transmitting Antenna, G = 4000 Effective aperture of the receiving Antenna, Ae = 4 m^2 Radar cross section of the target, σ= 25 m^2 Power of minimum detectable signal, S_{min} = 10^{-12}W	**10 Marks**	**L4**	**CO5**