Code No: **R1641041** **R16** **Set No. 1**

IV B.Tech I Semester Advanced Supplementary Examinations, May - 2022

RADAR SYSTEMS

(Electronics and Communication Engineering)

Time: 3 hours **Max. Marks: 70**

Question paper consists of Part-A and Part-B
Answer ALL sub questions from Part-A
Answer any FOUR questions from Part-B

*****

PART–A *(14 Marks)*

1. a) Define the radar cross section of a target and write the general formula for it. [3]
   b) Write the applications of CW radar. [2]
   c) What are the limitations of MTI radar? [2]
   d) What are the differences between a search radar and a tracking radar? [3]
   e) Describe the various noise components present in radar receiver. [2]
   f) List out the various functions of a duplexer. [2]

PART–B *(4x14 = 56 Marks)*

2. a) What are the advantages of integration radar pulses? Derive the expression for integration efficiency. [9]
   b) If the peak power of a radar is 100 KW, PRF is 1000 Hz, and the pulse width is 1 μs, calculate the average power in dB. [5]

3. a) Draw the block diagram of FMCW radar and explain its operation. [7]
   b) Estimate the range of a FMCW radar, if its frequency is modulated at a rate f_m over a range Δf, given Δf=1.5 kHz, f_m=100 kHz and the beat frequency is 40 Hz. [7]

4. a) Explain the operation of MTI radar with power oscillator transmitter with a neat block diagram. [7]
   b) An MTI radar operates at 5GHz with a pulse repetition frequency of 900 Hz. Calculate the lowest three blind speeds of this radar. [7]

5. a) Explain the principle of sequential lobing with a neat diagram. [7]
   b) Draw the block diagram of amplitude comparison monopulse tracking radar(two angular coordinate) and explain its operation. [7]

6. a) Derive the expression for frequency response function of a matched filter. [7]
   b) Describe the relation between the noise figure and noise temperature of a radar receiver. [7]

7. a) Explain how a circulator acts a duplexer with a neat diagram. [7]
   b) Ten linear array antennas are placed at a distance of 0.1 mm. the angle between the boresight and incoming waves is 30^0. Find the array factor when the wavelength of the received signal is 0.5 cm. [7]