# UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

**End Semester Examination, December 2017**

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| **Program: B.Tech ASEA** | | **Semester –** | **VII** |
| **Subject (Course):** | **Radar Technology** | **Max. Marks** | **: 100** |
| **Course Code :** | **ELEG 401** | **Duration** | **: 3 Hrs** |
| **No. of page/s:** | **01** | | |

**Sec(A)**

**All questions are compulsory and each carry 5 marks.**

1. Define radar wave forms, maximum unambiguous range and resolution? (CO1)
2. List out the frequencies used for RADAR and its various applications. (CO1)
3. What do you understand by the term clutter? (CO1)
4. Explain the need of modulation in CW Radar for detecting Moving targets? (CO2)

**Sec(B)**

**All questions are compulsory and each carry 10 marks.**

5. What is a Second-time-around echo? Derive the expression for maximum unambiguous range. (CO2)
6. The moon as a radar target may be described as follows: average distance to the moon is $3.844 \times 10^8$m and radar cross section is $6.64 \times 10^{11}$ $m^2$ and its radius is $1.738 \times 10^6$m. (CO2)
   i) What is the round-trip time (seconds) of a radar pulse to the moon and back?
   ii) What should the PRF be in order to have no range ambiguities?
7. Derive the maximum radar range equation if N-number of pulses received at the receiver. (CO2)
8. How the target can track with phase comparision Method? Explain? (CO3)

**Sec(C)**

**All questions are compulsory and each carry 20 marks.**

9. Radar mounted on an automobile to be used to determine the distance to a vehicle travelling directly in front of it. The radar operates at a frequency of 9375MHz with a pulse width of 10ns. The maximum range to be 500ft. Find PRF? If the antenna dimensions were 1ft by 1ft and the antenna efficiency were 0.6, what would be the antenna gain (dB)? (CO2)
10. Suggest the suitable techniques to acquisition of the moving target on azimuth & elevation plane? What is the need of AGC circuit in tracking radar systems? What is the working principle of AGC circuit? (CO4)

**Roll No: ----------**

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**Sec(A)**

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1. Explain minimum detectable signal & receiver noise. (CO1)

2. Explain Radar cross section of targets. (CO2)

3. Determine the peak power and duty cycle of a radar whose average transmitter power is 100 W, pulse width of 0.5μs and pulse repetition frequency of 2000 Hz. (CO1)

4. Explain in detail about system losses and propagation effects. (CO4)

**Sec(B)**

**All questions are compulsory and each carry 10 marks.**

5. With suitable diagram explain the working priniciple of conical scan technique. (CO3)

6. Explain briefly about amplitude comparison and phase comparison in monopulse radar. (CO3)

7. Find the pulse repetition frequency of a radar in order to achieve a maximum unambiguous range of 50 nmi and if the radar has a peak power of 600 kW, what is its average power with a pulse width of 1.8 μs. (CO1)

8. Explain Branch-type duplexer with a neat diagram. How circulator can be used as duplexer for protecting a receiver circuit? (CO4)

**Sec(C)**

**All questions are compulsory and each carry 20 marks.**

9. (a) If the noise figure of a receiver is 2.5dB, what reduction occurs in the S/N at the output compared to the S/N at the input? (CO2)

9. (b) Find the pulse repetition frequency of a radar in order to achieve a maximum unambiguous range of 50 nmi and if the radar has a peak power of 600 kW, what is its average power with a pulse width of 1.8 μs.

(CO1)

10. Comment on the need of integration of pulses in radar system? Derive the radar Range equation in terms of integration of pulses? Derive the maximum radar range equation if N-number of pulses received at the receiver. (CO2)