(g) Which RADAR is used to measure the altitude ?

(h) Why wave guide cavities cannot be used at very high frequencies ?

(i) List any *two* sensors to measure power.

(j) Mention the *two* methods to measure impedance of a given load.

MAR-21-210204

B. Tech. EXAMINATION, March 2021

Semester VI (NS)

MICROWAVE AND RADAR ENGINEERING

EC-325

Time : 2 Hours   *Maximum Marks :* 100

The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.

Note : Attempt *Four* questions in all, selecting *one* question from each Sections A, B, C and D. All questions carry equal marks.

Section A

1. Derive the expression for time-average power, when the electromagnetic field is time harmonic.   **25**

2. Explain, how short sections of open and short-circuited transmission lines can give distributed capacitance and inductance at high frequency ?   **25**

Section B

3. Discuss the principle of operation of an IMPATT diode and explain the origin of negative resistance in the operation of such a device ?   **25**

4. Why are phase shifters needed in a microwave network ? Outline the basic principle behind the design of microwave phase shifters ?   **25**

Section C

5. An identical two-cavity klystron amplifer operates at 4 GHz with $V_0 = 1$ kV, $I_0 = 22$ mA, cavity gap = 1 mm and drift space = 3 cm. If dc beam conductance and catcher cavity total equivalent conductance are 0.25×10^{-4} mhos and 0.3×10^{-4} mhos respectively Calculate :

(a) The beam coupling coefficient, dc transit angle in the drift space and the input cavity voltage magnitude for maximum output voltage.

(b) Voltage gain and efficiency, neglecting the beam loading.   **25**

6. Discuss the techniques of frequency tuning in a magnetron in detail.   **25**

Section D

7. Which RADAR is used to eliminate the drawback of CW RADAR ? Explain it with block diagram and write the expression for its beat frequency.   **25**

8. What is delay line canceller ? Derive the expression for delay line canceller.   **25**

9. Answer the following questions :   **10×2.5=25**

(a) What is the relation between reflection and transmission coefficient ?

(b) How to increase the power gain of a klystron ?

(c) What is a stub ? Name different types of stubs used for impedance matching ?

(d) What are linear beam tubes ? Name *three* of them ?

(e) What are the different modes of operation realisable with a Gunn diode ?

(f) What are Attenuators ? Outline their *two* important uses ?