Paper / Subject Code: 42404 / Microwave & Radar Engineering

(3 Hours)   Max Marks: 80

1. Question No. 1 is compulsory.
2. Out of remaining questions, attempt any three questions.
3. Assume suitable additional data if required.
4. Figures in brackets on the right hand side indicate full marks.

Q.1. (A) Write a short note on TRAPATT.   (05)
     (B) Write a short note on high electron mobility transistors.   (05)
     (C) Match a load impedance $Z_L=60-j80$ to a 50 Ω line using a double stub tuner. The (10)
         stubs are open circuited and are spaced λ/8 apart. The match frequency is 2 GHz.

Q.2. (A) With a neat functional diagram explain the working principle of Cylindrical   (10)
         Magnetron.
     (B) Derive equation for phase velocity, cutoff frequency, cutoff wavelength and   (10)
         field equations for rectangular waveguide.

Q.3. (A) Explain any one bio-medical application using microwave.   (10)
     (B) Explain the working of a negative resistance parametric amplifier.   (10)

Q.4. (A) What is the importance of beam coupling coefficient? Derive the equation of   (10)
         velocity modulation in klystron.
     (B) Given the circuit shown in Fig. 4(B), design a lumped element matching network   (10)
         at 60 MHz that would transform Load impedance $Z_L = 100 - j25$ Ω into an input
         impedance of $Z = 25 + j15$ Ω. Take $Z_0 = 50$ Ω.

Matching network

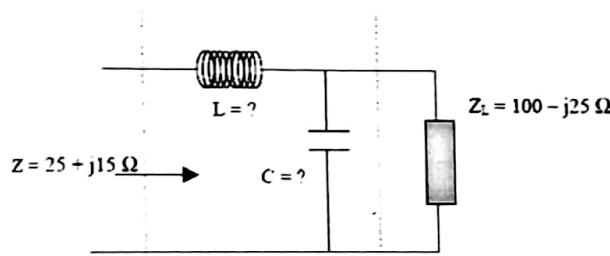Z = 25 + j15 Ω   L = ?   C = ? $Z_L = 100 - j25$ Ω

Fig. 4(B)

Q.5. (A) What is meant by RADAR range? Derive the equation for Radar range in terms   (10)
         of the noise figure.
     (B) Radar operating at 1.5 GHz uses a peak pulse power of 2.5 MW and has a range   (10)
         of 100 nmi for objects whose radar cross section is 1 m². If the minimum
         receivable power of the receiver is 2x10⁻¹³ Watt, what is the smallest diameter
         of the antenna reflector could have assuming it to be a full paraboloid with
         η=0.65.

Q.6.   Write a short note on following:
     (A) Gunn diode.   (07)
     (B) Hybrid Ring.   (07)
     (C) Instrument landing system.   (06)

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