**HOME ASSIGNMENT (EC sem 6- MICROWAVE ENGINEERING) 2017-18**

**Question-1:** A section of air filled K band wave having cross-section of 1.07 × 0.43 cm2 operates in frequency range 18.0 – 26.5 GHz. Find the cut off frequencies of the first two propagating modes and the percentage reduction in band width that this operating range represents, relating to the theoretical bandwidth for a single propagating mode.

**Question-2:** Find (a) cut off frequency (b) Group velocity at a frequency of 20 GHz

(c) Guided wave length at the frequency.

If an air filled rectangular waveguide of inside dimensions of 1.07 × 0.43 cm operates in the dominant mode TE10.

**Question-3:** (a) Find the cut off frequencies of first five modes at the operating frequency of 10 GHz.

(b) Find the alternation due to the dielectric and conductor losses, for beeswax ∈r = 2.35 and tan δ = 0.005 at 25oC & σ = 5.8 × 107 s/m.

If a length of beeswax filled copper X-band rectangular wave guide is having dimensions 2.286 × 1.016 cm.

**Question-4:** Compute the TE10-mode attenuation in dB/m, for k band waveguide operating at f = 20 GHz. The waveguide is made from brass and it is filled with dielectric material of ∈r = 2.2 and then δ = 0.002. Dimension is 1.07 × 0.43 cm2 brass resistivity is 107/2.564.

**Question-5:** A certain microstrip line has the following parameters:

∈r = 5.23, h = 7 mils, t = 2.8 mils, w = 10 mils. Find characteristic Impedance.

**Question-6:** A lossless parallel strip line has a conducting strip width w. The substrate dielectric separating the two conducting strips has a relative dielectric constant ∈rd of 6 (beryllia or beryllium oxide BeO) and a thickness d of 4 mm. Find inductance,capacitance and characteristic impedance and phase velocity.

**Question-7:** A coplanar strip line carries an average power of 250 mW and a peak current of 100 mA. Determine the characteristic impedance of the coplanar strip line.

**Question-8:** A shielded strip line has the following parameters:

(polystyrene): ∈r = 2.56; Strip width: w = 25 mils;

Strip thickness: t = 14 mils; Shield depth: d = 70 mils

Find characteristic impedance.

**Question-9:** An air filled waveguide with a cross section 2 × 1 cm transports energy in the TE10 mode at the rate of 0.5 hp. The impressed frequency is 30 GHz. What is the peak value of the electric field occurring in the guide.

**Question-10:** An air filled circular waveguide has a radius of 2 cm and is to carry energy at a frequency of 10 GHz. Find all the TEnp and TMnp modes for which energy transmission is possible.

Question-11: Find power density for following:

1. TE10 ,TE01 and TM11 modes in rectangular wave guide.
2. TE 01 ,TM01 and TE11 modes in Circular waveguide.

Question -12 Derive the formula for power transmitted in rectangular waveguide for TE10-mode,assuming all the required parameters .

Question-13: Derive the fields for (a) TEmn and TMmn mode in rectangular waveguide (b) TEnp and TMnp mode in circular mode.

Question-14:Define dominant mode and degenerate modes.

Question-15; Write a short note on (a) dielectric loss and conducting loss in waveguide (b) dielectric loss ,conducting loss and radiation loss in micro strip line (c)micro strip line,parallel strip line ,shielded strip line with characteristic impedance of each. (d) Phase velocity and group velocity .

Question-16. Find (a) waveguide impedance, guide wavelength, phase velocity ,group velocity for air filled waveguide of 7.0x3.5 cm2  for TE11 and TE10 modes operating at a frequency equal to 2.5 times the cutoff frequency.(b) find the same if waveguide is filled with relative dielectric constant of 2.56.(c) If the airfilled waveguide of 25cm long is enclosed at its ends , find the resonant frequency.