(3 Hours)   Total Marks: 80

N.B. : (1) Question number 1 is compulsory.
        (2) Attempt any three questions from remaining questions.
        (3) Figures to the right indicate full marks.
        (4) Assume suitable data wherever necessary and indicate the same.

Q.1   Write a short note on following: [20]
        (a) Strip lines
        (b) Image Frequency in Mixers
        (c) Dielectric Resonator Oscillator
        (d) Microstrip lines.

Q.2 (a) How is Vector Network Analyzer used to measure periodic large signal waveform   [10]
          with all harmonics.
     (b) Design a transistor oscillator at 4 GHz using a GaAs MESFET in a common gate   [10]
          configuration, with a 5 nH inductor in series with the gate to increase the stability.
          Choose a terminating network to match to a 50 Ω load, and an appropriate tuning
          network .The scattering parameters of the transistor in a common source
          configuration are $(Z_0= 50\ \Omega)\ S_{11}' = 2.18\angle-35°, S_{12}' = 1.26\angle18°, S_{21}' = 2.75\angle96°$,
          and $S_{22}' = 0.52\angle-155°$.

Q.3 (a) Draw the block diagram and explain scalar, passive, fundamental-frequency   [10]
          load/source pull.
     (b) Write a short note on Field Surveys.   [10]

Q.4 (a) Explain Hybrid and Monolithic MIC by comparing the two MICs in the following   [10]
          areas Cost, size and weight, Design flexibility, Circuit tweaking and Reliability.
     (b) The s parameters for the HP HFET-102 FET at 2 GHZ with a bias voltage V_{gs}=0   [10]
          are given as follows $(Z_0$=50 Ω)
          $S_{11}= 0.894 \angle -60.6°$
          $S_{21}= 3.122 \angle 123.6°$
          $S_{12}= 0.020 \angle 62.4°$
          $S_{22}= 0.781 \angle -27.6°$
          Determine the stability of this transistor by K- delta test and plot the stability
          circles on smith chart.

Q.5   Design an amplifier to have a gain of 11 dB at 4.0 GHz. Plot constant-gain circle   [20]
        for G_S = 2 and 3 dB, and G_L = 0 and 1 dB, Calculate and plot the input return loss
        and overall amplifier gain from 3 to 5 GHz. The transistor has the following
        scattering parameters $(Z0 = 50\ \Omega)$:

f (GHz)	S_{11}	S_{12}	S_{21}	S_{22}
3	0.80∠−90°	0	2.8∠100°	0.66∠ −50°
4	0.75 ∠−120°	0	2.5∠80°	0.60 ∠−70°
5	0.71∠ −140°	0	2.3∠60°	0.58∠−85°

Q.6 (a) Design an lumped impedance matching network using smith chart to match a load   [10]
          with an impedance Z_L =10+j10 Ω to a 50 Ω line at a frequency of 1GHz.
     (b) Draw and explain in detail Single-Ended Diode Mixer.   [10]

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