

(3 Hours)

[Total Marks : 80

- N.B. : (1) Question No. 1 is compulsory.
 (2) Attempt any four questions from question no. 2 to 7.
 (3) Assume suitable data if necessary, stating your assumption.

1. (a) Define standing wave ration (SWR). Show that 5

$$SWR = \frac{1+|\Gamma|}{1-|\Gamma|}$$
 where Γ is reflection coefficient
- (b) Explain with the help of a diagram, the structure of a microstrip line. 5
- (c) A typical PCB substrate consists of dielectric constant of 2.2 and loss tangent of 0.001 at 6 GHz. Find the conductivity of the substrate. 5
- (d) Explain physical properties of semiconductor. 5
2. (a) Calculate the input impedance of a 0.2 λ transmission line whose characteristics impedance is 50Ω and terminated with a load of $100 + j 50\Omega$. Use Smith chart. 10
- (b) Derive expressions for internal, external and loaded quality factors for the standard series and parallel resonant circuits. 10
3. (a) Draw the equivalent circuits and explain the RF behaviour of resistor, capacitor & inductor. 10
- (b) Explain the construction and principle of operation of HEMT and RFFET. 10
4. (a) Design a buterworth lowpass filter having a cut-off frequency of 200MHz and 20 dB attenuation of at 250 MHz. 10
- (b) State and prove any three Kuroda Identities. 10
5. (a) Discuss power consideration in transmission line when 10
 (i) Source and load impedances are matched.
 (ii) load impedance is matched and source impedance in not matched.
- (b) Show the RF small signal circuit model of BJT and equivalent model using miller effect. Find the value of C_{m1} and C_{m2} in terms of C_{cb} , V_{be} and V_{ce} . 10

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6. (a) Explain Schottky diode using its cross sectional view and circuit model. 10
10
(b) An abrupt p-n junction made of Si has acceptor and donor concentration of $N_A = 3 \times 10^{18} \text{ cm}^{-3}$ and $N_D = 8 \times 10^{15} \text{ cm}^{-3}$ respectively. Assuming the device at room temperature. Determine
(i) barrier voltage
(ii) the space charge width in the p and n type semiconductor 20
7. (a) Write short notes on following :
(a) Measurement of AC parameters of BJT
(b) Chebyshev filter
(c) Realization of capacitor and inductor using transmission lines.