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SE-7381

B. E. IV (Sem - VII) (Electronics & Communication) Examination

April / May – 2011

Microwave Techniques

Time : **3** Hours] [Total Marks : **100**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **B. E. 4 (Sem - 7) (E.C.)**

Name of the Subject :

☛ **Microwave Techniques**

☛ Subject Code No. : **7 3 8 1** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Attempt all questions.

(3) Assume suitable data wherever necessary.

(4) Figures to the right indicate full marks.

(5) Use of scientific calculator CASIO FX 82/83 FX-100 or equivalent is allowed.

1 (a) Answer the following questions in brief with proper justification : **10**

(1) What is the importance of impedance matching in transmission line ?

(2) What do you mean by cavity resonator ?

(3) A transmission line has the following parameters : R = 2 Ω/m, G = 0.5, m-mho/m, f = 1 GHz, L = 8 nH/m, C = 0.23 pF. Calculate propagation constant.

(4) In connection with any transmission line, list out the causes of occurrence of reflection.

(5) Briefly explain how magic tee can work as a duplexer.

(b) Derive the relationship between the transmission coefficient and the reflection coefficient. **5**

(c) Derive the expression for resonance frequency considering rectangular cavity resonator. **5**

2 Attempt the following questions :

(a) Derive the equations related to Smith chart. Give an idea of family of circles. 8

(b) A lossless line has a characteristic impedance of 50 Ω and it terminated in a load resistance of 75 Ω. The line is energized by a generator which has an output impedance of 50 Ω and an open circuit output voltage of 30 V (rms). The line is assumed to be 2.25 wavelength long. Calculate (i) input impedance, (ii) magnitude of instantaneous load voltage, (iii) instantaneous power delivered to the load. 7

OR

2 Attempt the following questions :

(a) With the use of transmission line equation, derive the formulas for the following terms : (i) Propagation constant, (ii) Attenuation and phase constant, (iii) Characteristic impedance, (iv) Phase velocity. 7

(b) For a transmission line Ro = 50 Ω and SWR = 2 when the line is loaded. When the load is shorted then minima shifts 0.15 λ towards the load. With the use of Smith chart determine the load impedance. 8

3 Write short notes : (any **three**) 15

(1) Bathe hole directional coupler

(2) Microwave attenuator and its applications

(3) Micro strip lines and their benefits cum limitations

(4) Faraday's rotation devices and their working.

4 (a) (1) What are the advantages and limitations of RADAR ? 10

(2) Write types of magnetron with approx. range of frequency at which they can be used.

(3) List problems associated to conventional devices at microwave frequencies.

(4) Write application of TWT.

(5) Give the classification of solid state microwave devices.

(b) Give classification of RADAR. Draw and explain block diagram of monostatic radar.

(c) Explain construction of Tunnel diode with necessary sketch and draw V-I characteristic.

5 Answer the following : (any **two**) **15**

(a) Explain constructional features of TWT with necessary derivation and schematics.

(b) Draw symbol and characteristics of Tunnel diode. Explain tunnel diode amplifier with circulator.

(c) What are the different types of klystron ? Explain two cavity klystron oscillator with necessary diagram.

(d) (i) A guided missile tracking radar has : transmitted power = 400 kW, pulse repetition freq = 1500 pps and pulse with = 0.8 μ see. Calculate unambigous range, duty cycle, average power and suitable BW of radar.

(ii) A military radar operates at 5 GHz with 2.5 mW power output. If antenna diameter is 5 m, receiver BW is 1.6 GHz and has a 12 dB noise figure. What is the maximum detectable range for $1m^2$ target ?

6 Write short notes : (any **three**) **15**

(a) Reflex klystron

(b) CW doppler radar

(c) Varactor diode

(d) Radar range equation

(e) Magnetron Tube.
