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Printed Pages : 4 **TEC – 604**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3094 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. VI) EXAMINATION, 2006-07

MICROWAVE & RADAR ENGINEERING

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

Note : *Attempt **all** the questions.*

1 Attempt any **four** of the following : **5×4**

(a) For a rectangular wave guide of internal dimension 7.214 x 3.404 cm operting at 5 GHz, find out the propagation constant and phase velocity for TE_{10} and TE_{11} mode of propagation. **5**

(b) Find the field component present in TM_{11} mode of propagation. **5**

(c) How TE_{10} and TM_{11} mode can be excited in rectangular wave guide ? Draw its figure also. **5**

(d) An air filled cylindrical wave guide of internal diameter 5 cm supports TE_{11} mode of propagation. If p_{11} = 1.84 find out the cutoff frequency, guide wavelength and wave impedance at 3GHz. **5**

(e) What are various types of attennuation taking place in any wave guide? **5**

(f) Define quality factor of any resonator. Design a rectangular cavity to have resonant frequency of 10.2 GHz having dimensions a=d and b = a/2. **5**

2 Attempt any **four** of the following : **5×4**

(a) With support of figures explain the working of wave guide bends and twists. **5**

(b) What is S-parameters? Derive S parameter of Hybrid Tee if all the ports of the Tee are matched and power incident from port 3 only? **5**

(c) Explain the working of multihole directional coupler if power incidental from input port is 25W at output. **5**

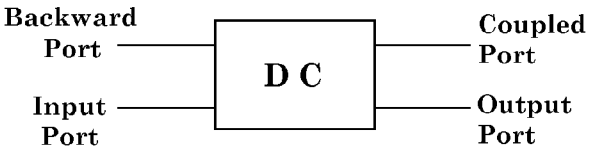

Fig. 1

port is 15W, coupled port is 5W and at Backward port is 1W; find Directivity and coupling coefficients of the coupler.

(d) How VSWR of the unknown load is measured with the help of slotted wave carriage using microwave bench set up. Draw the block diagram of the set up. **5**

(e) What are Non reciprocal devices. Explain any one with support of figure. **5**

(f) What is the role of crystal detector in microwve frequency measurements. Discuss any one radiation pattern measurement technique. **5**

3 Attempt any **two** of the following : **2×10**

(a) Explain principle of operation, performance characteristics and application of two cavity klystron. **10**

A two cavity Klystron operates at 5GHz with dc beam voltage 10 kV and cavity gap 2 mm. For a given input RF voltage. The magnitude of the gap voltage is 100 V. Calculate the transit time at the cavity gap transit angle and the velocity of the electrons leaving the gap.

(b) With the help of schematic diagram explain the working of cavity magnetism. What is the role of slow wave structure in TWT ? **10**

(c) What is transferred electron effect and how it is utilized in generation of microwave signal in Gunn diode. Compare it with tunnel diode? **10**

4 Attempt any **two** of the following : **2×10**

(a) Explain the working of any two of the following : **10**

(i) IMPATT

(ii) Varactor diode

(iii) PIN diode

(b) (i) A microwave point contact diode detector has a reverse saturation current of I μ A. Find the detector current of microwave signal amplitude of 1V at room temp. when n = 1.4 and V_T=26 mV. **10**

(ii) With the help of Block diagram explain the working of pulse radar.

(c) With the help of schematic block diagram, explain Radar transreceiver system. Derive the expression for Radar range equation. **10**

5 Attempt any **two** of the followings : **2×10**

(a) Discuss various Radar applications. Discuss various microwave signal generator used as Radar transmitters.

(b) Describe doppler effect and how it is utilized in CW radars. With support of mathematical equations explain the operating principle and working of FM CW radar.

(c) (i) What is the role of Duplexers Radar Antennas and front end amplifiers. **6**

(ii) Describe MTI radars. **4**