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[96] SEAT No._____ No. of printed pages: 2

SARDAR PATEL UNIVERSITY

M. Sc. (Physics) III[rd] Semester Examination

Day and Date: Tuesday, 7th November, 2017

Time: 10.00 am to 1.00 pm

Subject: Microwave communication: Electronics and technology

Paper No: PS03EPHY03

Total Marks: 70

Note: All questions are compulsory.

Q.1 Multiple choice Questions. (8)

(1) _____ is a lowest power microwave device.
(a) Klystron (b) Magnetron (c) Gunn diode (d) TWT

(2) _____ can be used as a microwave switch.
(a) Schottky barrier diode (b) Varactor diode (c) P - I - N diode (d) Gunn diode.

(3) _____ mode of propagation is dominant in circular waveguide.
(a) $TE_{1,0}$ (b) $TE_{1,1}$ (c) $TE_{0,1}$ (d) $TM_{0,1}$

(4) VSWR in a transmission line is always between _____.
(a) 0 and 1 (b) 1 and infinity (c) -1 and +1 (d) 0 and infinity

(5) The radio horizon is an important parameter for _____ wave propagation of e. m. waves.
(a) ground (b) space (c) tropospheric (d) ionospheric

(6) _____layers of ionosphere exist during night time.
(a) D, E, F (b) F_1, F_2 (c) D , E (d) E , F

(7) _____antenna is an example of resonant antenna.
(a) horn (b) dipole (c) dish (d) parabollic

(8) The radiation pattern of a dipole antenna having length of 2 wavelengths will contain _____ lobes.
(a) 4 (b) 8 (c) 2 (d) 6

Q.2 Short answer questions (Attempt any seven) (14)

(1) Discuss the structure and I – V characteristics of Gunn diode.

(2) With the help of Applegate diagram, explain how bunching of electrons takes place in Klystron tube.

(3) "The transmission lines behave like a low pass filter." Justify this statement.

(4) "The waveguide has a frequency response similar to a high pass filter." Explain this statement.

(5) Why the space wave propagation of e. m. waves is also known as direct wave propagation?

(6) Calculate the distance of radio horizon for transmitting antenna for space wave propagation of electromagnetic waves when the height of a transmitting antenna is 16 m.

(7) What is a difference between resonant antenna and non resonant antenna?

(8) What is the function of a radiator in parasitic dipole antenna?

(9) "The dimensions of waveguide are frequency dependent." Give reasons for this statement.

Q.3 (a) Sketch the structure and discuss the operation and limitations of varactor diode. (6)

(b) Draw the structure and explain the workingof travelling wave tube. Why is it called a slow wave structure? (6)

OR

(b) Using necessary schematic diagram showing electric and magnetic field lines, describe the construction and working of a cavity magnetron. Also, mention the frequency and power limits of this microwave device. (6)

Q.4 (a) Calculate the dimensions of a rectangular waveguide used for propagation of $TE_{1,0}$ mode of a signal having frequency 10 GHz. Also calculate the area of this waveguide. (6)

(b) Using necessary figure, describe the construction and working of a rotating join used to couple two different pieces of waveguide. (6)

OR

(b) Mention the differences between parallel wire line and co-axial line. Also write down their frequency range of operation. What are the sources of primary line constants in transmission line? (6)

Q.5 (a) Classify the wave propagation mechanism in free space. What are the differences between the ground wave propagation and space wave propagation? Describe in detail the propagation of electromagnetic waves along the earth surface. (6)

(b) Why the density of ions is quite large in ionosphere? Mention different layers of ionosphere. Represent these layers graphically with reference to their height from earth surface and their widths. Which layers are vanished during night time? Why? (6)

OR

(b) Why satellite communication is used for long distances? Discuss the process involved in satellite communication. (6)

Q.6 (a) Draw the schematic diagram representing the transmission and reception of e. m. waves in dish antenna along with its structure. Describe the working of a dish antenna. (6)

(b) What is loop antenna? What is its function? Using necessary structural diagram, explain the working of loop antenna. (6)

OR

(b) Discuss the construction and operation of driven arrays antenna. (6)

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