University Roll No.:_____

J.C.BOSE UNIVERSITY OF SCIENCE & TECHNOLOGY, YMCA FARIDABAD

B.Tech Examination DEC. 2018

Microwave and Radar Engineering (ECE-312)

Time: 3hrs **M. Marks: 60**

Note: Attempt all the questions in Part -I. Attempt any four questions from Part –II.

PART-I

Q.1 (i)	What are cavity Resonators ?	(2)
(ii)	What do you mean by rat race junction?	(2)
(iii)	What do you mean by attenuation? How it can be measure?	(2)
(iv)	What is the principle of microwave phase shifter?	(2)
(v)	Discuss different applications of PIN diode.	(2)
(vi)	What is parametric amplifier ?	(2)
(vii)	What are MEFETS ?	(2)
(viii)	What is velocity modulation ?	(2)
(ix)	What is back heating ? How can it be avoided	(2)
(x)	Write the application of Magnetron	(2)

PART-II

Q. 2 (a)	Why TEM waves do not exist in rectangular waveguide? Which is dominant mode of propagation in rectangular mode and why?	(5)
b	For the dominant mode of operation is an air filled circular waveguide of inner diameter 4cms. Find (a) cutoff wavelength (b) cutoff frequency (c) wavelength in guide	(5)
Q. 3(a)	Describe the various techniques of measuring unknown frequency of a microwave generator	(5)
(b)	What are S-parameters? Derive the expression for Hybrid Tee if all the ports of the Tee are matched and power incident from port 3 only.	(5)
Q4 a	How is bunching achieved in a cavity magnetron? Explain the phase focussing effect.	(5)

b Calculate the resonant frequency of a circular resonator of following dimensions. Diameter =12.5 cms and length = 5 cms for TM_{012} mode.

Q. 5(a) Explain the operation of schottky barrier diode. (5)

(b) Explain the tunnel diode characteristics with aid of energy band diagram. (5)

Q. 6(a) State the manley Rowe relations as applied to parametric amplifiers. What are the conditions for parametric up converter and down converter. (5)

(b) A negative resistance par amplifier has a signal frequency of 2 GHz, pump frequency of 12 GHz, output resistance of signal generator is 16 Ω. Determine (a) power gain in dB (b) power gain if it work is USB converter. (5)

Q. 7(a) Discuss the principle of MASERs and explain the construction of a typical helium ruby laser (5)

(b) A marine radar system operating at 10 GHz has a maximum range of 50 Km with an antenna gain of 4000.if the transmitter has a power of 250 kW and minimum detectable signal of 10^{-11} W. Determine the cross section of target the radar can see. (5)