

of 1 MHz, with amplitude modulation index of 0.5 and 0.2 respectively. Write the resultant expression for complex AM signal and sketch its frequency spectrum. (5)

(c) What is pulse code modulation (PCM)? Explain briefly, generation and detection of PCM. (5)

Roll No.

Total Pages : 4

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M.Sc. (Physics) – III SEMESTER

Analog Electronics (MPE-303)

Time : 3 Hours]

[Maximum Marks : 75

Instructions :

1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
2. Answer any **four** questions from Part-B in detail.
3. Different sub-parts of a question are to be attempted adjacent to each other.

PART-A

1. (a) Why isolators are called uniline? (1.5)
(b) What are the different types of Directional coupler? (1.5)
(c) What are the factors that reduce efficiency of IMPATT diode? (1.5)
(d) Define the term radar range resolution and write its equation. (1.5)
(e) Why conventional open wire lines are not suitable for microwave transmission? (1.5)

- (f) What are the advantages of coplanar strip line over conventional parallel strip line? (1.5)
- (g) What is single tone and multi tone modulation? (1.5)
- (h) What are the disadvantages of single side band transmission? (1.5)
- (i) What are Range gate Doppler filters? (1.5)
- (j) Draw the signal waveform of PAM, PWM and PPM. (1.5)

PART-B

2. (a) Explain the operation of a two cavity klystron amplifier. Derive expressions for bunched beam current and efficiency. (10)
- (b) A wave guide operating in TE₁₀ mode has dimensions $a = 2.26$ cm and $b = 1$ cm. The measured guide wave length is 4 cm. Find (i) Cut off frequency of the propagating mode (ii) The frequency of operation (iii) Maximum frequency of propagation in this mode. (5)
3. (a) Differentiate between narrowband FM and wideband FM with their frequency spectrum and suitable mathematical expressions. (5)
- (b) Define PAM. Write down its disadvantages. (5)
- (c) Why super heterodyne receiver is better than the TRF receiver? Explain. (5)

4. Derive the simple radar range equation in terms of minimum detectable signal to noise ratio $(S/N)_{\min}$ and explain why $(S/N)_{\min}$ is a better measure of a radar detection than the minimum detectable signal (S_{\min}) . (15)
5. (a) Explain clearly how a GUNN diode is different from a tunnel diode as both are negative resistance devices. (5)
- (b) Explain the method of generating AM waves using Non-Linear circuits. (10)
6. (a) Define Kepler's laws and explain with neat diagram, apogee & perigee points of the orbit of the satellite. (5)
- (b) List the differences between Lower Earth Orbit and Middle Earth Orbit satellites. (5)
- (c) Why the satellite uplink frequency is different from down link frequency. Draw the block diagram of satellite communication depicting uplink and downlink. (5)
7. (a) Define aperture of an antenna and find its relation with directivity. (5)
- (b) An arbitrary modulating signal consisting of two modulating frequencies of 1 kHz and 2 kHz modulated a carrier signal having peak amplitude level of 1 V and frequency