



Name:		••••••	Roll No.:
Branch:			Signature of Invigilator:
Semester:	Vlth	Date: 02/05/20	22 (MORNING)

## Subject with Code: **EE417 FUNDAMENTALS OF COMMUNICATION SYSTEMS**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)
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- 1. The booklet (question paper cum answer sheet) consists of two sections. <u>First section consists of MCQs of 30 marks</u>. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. <u>The Second section of question paper consists of subjective questions of 20 marks</u>. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
- 2. <u>The booklet will be distributed to the candidates before 05 minutes of the examination</u>. Candidates should write their roll no. in each page of the booklet.
- 3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. <u>All the entries on the cover page must be filled at the specified space.</u>
- 4. <u>Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly</u> <u>prohibited inside the examination hall</u> as it comes under the category of <u>unfair means</u>.
- 5. <u>No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination.</u> Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and <u>last 10 minutes of the examination.</u>
- 6. Write on both side of the leaf and use pens with same ink.
- 7. <u>The medium of examination is English</u>. Answer book written in language other than English is liable to be rejected.
- 8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
- 9. The door of examination hall will be closed 10 minutes before the end of examination. <u>Do not leave the examination</u> <u>hall until the invigilators instruct you to do so.</u>
- 10. Always maintain the highest level of integrity. <u>Remember you are a BITian.</u>
- 11. Candidates need to submit the question paper cum answer sheets before leaving the examination hall.

## BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI END SEMESTER EXAMINATION

CLASS : B. TECH. BRANCH : EEE

SUBJECT: EE417 Fundamentals of Communication System

SEMESTER: VI SESSION: SP/2022

## TIME : 2 HOURS

FULL MARKS: 50

INSTRUCTIONS:

1. The question paper has two sections, Part-A and Part-B. The Part-A contains 30 MCQ questions each of 1 mark and Part-B contains 8 subjective questions each of 2.5 marks. Candidates must attempt all.

Part-A

- 2. The MCQs should be answered by ticking ( $\checkmark$ ) the most appropriate options.
- 4. The missing data, if any, may be assumed suitably.

Q1. Find the trigonometric Fourier series for the periodic square wave w(t) shown in figure (assume  $\omega_0 T_0=2\pi$ ) w(t) -π 5 3π 充う a)  $\frac{1}{2} + \frac{2}{\pi} (\cos \omega_0 t - \frac{1}{3} \cos 3\omega_0 t + \frac{1}{5} \cos 5\omega_0 t - \frac{1}{7} \cos 7\omega_0 t + ...)$ b)  $\frac{1}{2} + \frac{4}{\pi} (\cos \omega_0 t - \frac{1}{2} \cos 3\omega_0 t + \frac{1}{5} \cos 5\omega_0 t - \frac{1}{7} \cos 7\omega_0 t + \cdots)$  $\frac{1}{4} + \frac{1}{\pi} (\cos \omega_0 t - \frac{1}{3} \cos 3\omega_0 t + \frac{1}{5} \cos 5\omega_0 t - \frac{1}{7} \cos 7\omega_0 t + \cdots)$ C)  $\frac{1}{4} + \frac{2}{\pi} (\cos \omega_0 t - \frac{1}{2} \cos 3\omega_0 t + \frac{1}{\pi} \cos 5\omega_0 t - \frac{1}{\pi} \cos 7\omega_0 t + ..)$ d) Which of the following is correct with reference to Parseval's Theorem for aperiodic signal  $\int_{-\infty}^{\infty} |x(t)|^2 dt$ ? Q2.  $\int_{-\infty}^{\infty} |X(F)|^2 dF$  $\int_{-\infty}^{\infty} |X^*(F)|^2 dF$ a) b)  $\int_{-\infty}^{\infty} |X(F)X^*(F)| dF$ All of these d) c) Which of the following relations are true if x(n) is real? Q3.  $X(\omega)=X(-\omega)$  $X(\omega) = -X(-\omega)$ a) b)  $X^*(\omega) = X(\omega)$ d)  $X^*(\omega)=X(-\omega)$ c) If  $X(\omega)$  is the Fourier transform of the signal x(n), then what is the Fourier transform of the signal x(n-k)Q4. e<sup>jωk</sup>. X(-ω)  $e^{j\omega k}$ . X( $\omega$ ) a) b)  $e^{-j\omega k}$ . X( $\omega$ )  $e^{-j\omega k}$ . X(- $\omega$ ) c) d) Find the Fourier transform of  $j/\pi t$ Q5. a) sinc( $\omega$ ) b) sa(ω) c) δ(ω) d) sgn(ω) The Fourier transform of a Gaussian pulse is also a Gaussian pulse Q6. False a) True b) Find the Fourier transform of  $exp(j\omega_0 t)$ Q7.  $\delta(\omega + \omega_0)$ b)  $2\pi\delta(\omega + \omega_0)$ a)  $\delta(\omega - \omega_0)$ d) 2πδ(ω - ω0) c) Find the Fourier transform of u(-t) Q8. πδ(ω) + 1/ω  $\pi\delta(\omega) + 1/i\omega$ a) b) πδ(ω) - 1/iω  $\delta(\omega) + 1/j\omega$ c) d) Telephones send information through wires in form of Q9. radio signals b) electrical signal a) electromagnetic waves c) d) microwaves Q10. A carrier of peak voltage 15 V is used to transmit a message signal. If the modulation index is 80%, then what will be the peak voltage of the modulating signal? a) 10 V b) 11 V 12 V 13 V c) d) Q11. An AM signal is represented by  $x(t) = [20 + \sin(500\pi t)]\cos(2\pi t \times 10^5)V$ . What is the modulation index? a) 0.2 b) 0.25 0.4 d) 0.5 c) Q12. An AM signal is represented by  $x(t) = (20 + \sin(500\pi t))\cos(2\pi t \times 10^5)V$ . What is the total signal power? 225 250 a) b) 200 400 d) C) Q13. A carrier is simultaneously modulated by two sine waves with modulation indices of 0.4 and 0.3. The resultant modulation index will be b) 0.7 a) 1.0 c) 0.5 d) 0.35 Q14. Identify the one that is not required in the process of production of amplitude modulated wave? Rectifier Square law device b) a) Bandpass filter Combination of message and carrier signal c) d)

Q15. A 1 MHz sinusoidal carrier is amplitude modulated by a symmetrical square wave of period 100 µsec. Which of the following frequencies will not be present in the modulated signal? a) 980 Hz 1020 Hz b) 1040 Hz d) 1060 Hz C) Q16. Which among the following can be detected by an envelope detector? Low frequency AM waves b) Very low frequency AM waves a) Envelope detectors cannot detect AM waves d) High frequency AM waves C) Q17. Which of the modulation scheme requires the minimum transmitted power and minimum channel bandwidth? VSB DSB-SC a) b) SSB AM c) d) Q18. The AM square-law modulator circuit at output uses a) Band Pass Filter **High Pass Filter** b) c) Low pass filter d) None of these Q19. FM is called constant envelope because \_\_\_\_\_ of carrier wave is kept constant. a) Frequency b) Amplitude c) Phase d) Angle Q20. Which of the following are two methods for generating FM signal? a) Coherent method, noncoherent method b) Product detector, envelope detector c) Direct method, indirect method d) Slope detector, Zero crossing detector Q21. Determine the modulation index [ $\beta$ ] and the expression of FM signal [E(t)] for single tone message signal [Em(t)], when Em,max=1 V, Ec,max=10 V, k=2000 Hz/V and fm=1 KHz and fc=20 KHz. 2, E(t)=10cos(4pi\*10^4t+2sin(2pi\*10^3t)) 3, E(t)=10cos(4pi\*10^4t+3sin(2pi\*10^3t)) a) b) 4, E(t)=10cos(4pi\*10^4t+4sin(2pi\*10^3t)) 6, E(t)=10cos(4pi\*10^4t+6sin(2pi\*10^3t)) c) d) Q22. The bandwidth of a FM wave, when maximum deviation is 50KHz and the modulating signal's frequency is 15KHz, is a) 130 KHz 260 KHz b) 65 KHz 50 KHz C) d) Q23. In a mixer circuit, the input signal frequency is  $f_c$  and local oscillator frequency is  $f_l$ , what is the centre frequency of the bandpass filter if frequency down-conversion is performed? a) f<sub>c</sub>+f<sub>l</sub> b) f<sub>c</sub>-f<sub>l</sub> C)  $f_c/f_l$ d)  $f_l/f_c$ Q24. Quantization noise can be reduced by \_\_\_\_\_\_ the number of levels. a) Decreasing Increasing b) Doubling d) Squaring c) Q25. DPCM encodes the PCM values based on a) Quantization level Difference between the current and predicted value b) Interval between levels None of the mentioned c) d) Q26. Matched filter is a \_\_\_\_\_ technique and is basically a......pass filter. a) modulation, low modulation, high b) c) demodulation, low d) demodulation, high Q27. Which FSK has no phase discontinuity? a) Continuous FSK Discrete FSK b) c) Uniform FSK d) None of the mentioned Q28. The synchronization necessary for BPSK is a) Frequency tracking b) Bit timing c) Phase tracking All of the mentioned d) Q29. Thermal noise is independent of a) Boltzmann's constant temperature b) bandwidth centre frequency C) d) Q30. The noise due to random behaviour of charge carriers is Shot noise Partition noise a) b) Industrial noise Flicker noise c) d) Part-B Q31. State and prove the Time-scaling property of the Fourier Transforms.

- Q32. Differentiate between Energy Spectral Density (ESD) and Power Spectral Density (PSD).
- Q33. Explain Switching modulator to generate AM waves.
- Q34. Describe Coherent-Demodulator or Synchronous detection for DSB-SC waves.
- Q35. For a single-tone FM, define Narrow-Band FM and Wide-Band FM.
- Q36. What the use of Phase-Locked-Loop for demodulation for FM wave. Explain briefly.
- Q37. Explain the working of an FSK system a with suitable block diagram.
- Q38. Define Noise-equivalent-bandwidth and Noise-equivalent-temperature?

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