

This question paper contains 3 printed pages]

*Your Roll No*

**5200**

**B.Sc. (Prog.) / III**

**J**

**EL-301 – ELECTRONICS  
COMMUNICATIONS**

**(NC – Admissions of 2005 and onwards)**

**Time : 3 Hours**

**Maximum Marks : 75**

*(Write your Roll No on the top immediately on receipt of this question paper )*

**Attempt any five questions**

**All questions carry equal marks.**

- 1 (a) The Fourier series for a half wave rectified sinusoidal current wave of 1 ampere amplitude is

$$i(t) = \frac{1}{\pi} + \frac{1}{2} \sin \omega t - \frac{2}{\pi} \left( \frac{\cos 2 \omega t}{1 \times 3} + \frac{\cos 4 \omega t}{3 \times 5} + \frac{\cos 6 \omega t}{5 \times 7} + \dots \right)$$

Draw frequency spectrum upto the eighth harmonic.

**3**

- (b) Define filter transfer function. Draw the response curve of a LPF

**5**

- (c) With the help of a block diagram, give the working of a superhetrodyne receiver

**7**

- 2 (a) An audio signal given as  $15 \sin 2\pi (1500 t)$  amplitude modulates a carrier given as  $60 \sin 2\pi (10,000 t)$  Sketch audio signal, carrier signal, modulated wave and frequency spectrum Determine modulation index **8**
- (b) Describe the working of a envelope detector with relevant waveforms What is diagonal peak clipping ? **7**
- 3 (a) Derive an expression for FM wave Define the following terms for FM wave  
 (i) carrier swing  
 (ii) frequency deviation  
 (iii) percentage modulation  
 (iv) frequency modulation index **8**
- (b) Explain how one can obtain 'frequency modulation using a varactor diode Give drawbacks of the direct method **7**
- 4 (a) Compare FM with AM Derive an expression for total power in an AM wave **8**
- (b) Explain with the help of circuit diagram and necessary theory the functioning of a Foster-Seeley discriminator **7**
- 5 (a) State and prove the sampling theorem **8**
- (b) What is multiplexing ? Give the block diagram of a TDM system **7**

- 6 (a) Explain quantization in a PCM system  
Derive an expression for  $S/N$  ratio for a PCM system 8
- (b) Using a block diagram, explain how QPSK is obtained 7
- 7 (a) Derive an expression for the height of a geo stationary orbit Draw the block diagram of a satellite repeater system and explain the function of each block 8
- (b) What are the conditions for total internal reflection ? Derive an expression for acceptance angle and numerical aperture for an optical fiber 7
- 8 Write short notes on any **two** of the following
- (a) Fax and Modem
- (b) GSM
- (c) AM transmitter
- (d) Phasing method to produce SSB 7.5 × 2
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