

JK Lakshmipat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, December 2022

B. Tech. (EEE), Semester VII, 2022-23

Roll No.....

EE1211: Advanced Communication Systems

Time: 3 hours

Max. Marks: 30

Instructions to students: Answer ALL questions

1. Do not write anything other than your roll number on question paper
2. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever required are an integral part of the answer
3. Use of programmable calculator, class lecture notes/handouts, etc., are not allowed
4. Assume suitable data wherever required and mention it clearly

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- Q. 1 (i) Compute the NA, acceptance angle and the critical angle of a fibre having core refractive index $\mu_1 = 1.5$ and cladding refractive index $\mu_2 = 1.45$. 5
[CO 1]
- (ii) Compute the cutoff parameter and the number of modes supported by a fibre with core refractive index $\mu_1 = 1.54$ and cladding refractive index $\mu_2 = 1.5$. The core radius is $25 \mu\text{m}$ and the operating wavelength is 1300nm .
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- Q. 2 (i) A $125 \mu\text{m}$ stepped index fibre has $\text{NA} = 0.28$ and core $\mu_1 = 1.5$. Calculate the intermodal pulse broadening and bandwidth for 5 km fibre. If there is pulse overlapping due to dispersion, derive the bit rate under ideal conditions and the optimal bit error rate. 6
[CO 1, 2]
- (ii) Plot the graphs of propagating waveforms through an optic fibre indicating rise time, halfwidth broadening and rms broadening and, with these terms obtain the bandwidth-length product relation.
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- Q. 3 (i) Compare 3G and 4G/LTE cellular systems in terms of underlying technologies used and infrastructure. Comment on the additional features of 5G in terms of latency, enhanced mobility and MIMO technique. 7
[CO 3, 4]
- (ii) Differentiate between FDMA/FDD and TDMA/FDD using appropriate graphs and examples. Illustrate proper and improper handoffs w.r.t received signal levels when mobile stations move from one cell to another
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- Q. 4 Total of 33 MHz of bandwidth is allocated to a FDD cellular system using two 25 KHz simplex channels to provide full duplex voice and control channels. Calculate the number of channels available per cell for 4 cell, 7 cell and 12 cell reuse capability. If 1 MHz of the allocated spectrum is dedicated to control channels, then calculate the equitable distribution of control channels and voice channels in each cell for the three reuse systems. 8 [CO 4]
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- Q. 5 Design a square microstrip patch antenna to resonate at the WiFi frequency. Use RT Duroid material with $\epsilon_r = 2.2$ and substrate thickness = 0.8 mm. Mention one AISG standard to ensure EMC for using such antennas for cellular phones. 4 [CO 5, 6, 7]
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