

JK Lakshmi Pat University, Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2022
B. Tech. (ECE), Semester IV, 2021-22

Roll No.....

EE1104: Electromagnetics and Microwaves

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 Prove that $\text{div} (\nabla \times \mathbf{E}) = 0$ Where $\mathbf{E} = E_x \mathbf{i} + E_y \mathbf{j} + E_z \mathbf{k}$. 2.5
(CO 2 & 3)
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- Q. 2 Explain transformer and motional electromotive forces using Maxwell Equations. 2.5
(CO 1, 2, 3)
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- Q. 3 Discuss the boundary conditions for electric field lines propagating through Conductor – dielectric interface. Explain the refraction condition of electric field at the boundary with an example. 5
(CO 1, 2 & 3)
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- Q. 4 In a lossless dielectric for which $\eta = 30 \pi$, $\mu_r = 1$, and $\mathbf{H} = -0.3 \cos(\omega t - z) \mathbf{a}_x + 0.8 \sin(\omega t - z) \mathbf{a}_z$ A/m, calculate ϵ_r and ω . 5
(CO 2 & 3)
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- Q. 5 A transmission line has a characteristic impedance of $50 + j0.01 \Omega$ and is terminated in a load impedance of $73 - j42.5 \Omega$. Calculate (a) the reflection coefficient (b) SWR 4
(CO 4 & 6)
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- Q. 6 Draw the US standard X-band rectangular waveguide WR-90 mentioning its dimensions and X band frequency range. Mark the uniform plane wave propagation through it and define the TE_{mn} and TM_{mn} modes, mentioning what is m and n. Analyzing the TE mode equation $H_z = C[\cos(m\pi x/a)\cos(n\pi y/b)]$, show for which m,n values the TE modes exist. 6
(CO 4 & 6)
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- Q. 7 Sketch and indicate the arms and ports of an E plane waveguide tee and characterize its S matrix for a matched junction 5
(CO 6, 7 & 8)
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