

KATHMANDU UNIVERSITY
End-Semester Examination
March/April 2017

Marks Scored:

Level : B.E.
Year : IV

Course : ETEG 402
Semester: I

Exam Roll No. :

Time : 30 mins.

F.M. : 20

Registration No.:

Date : APR 03 2017

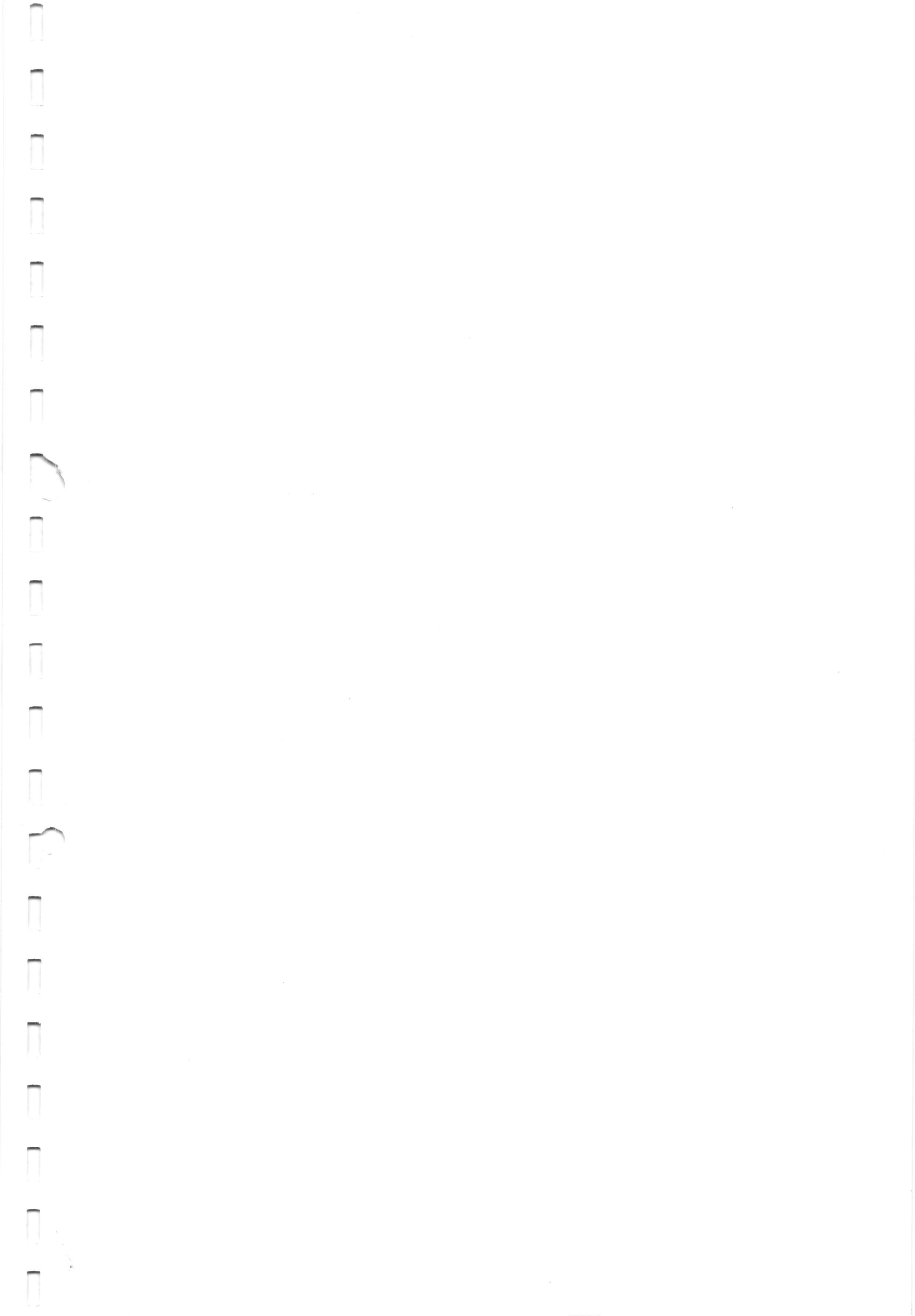
SECTION "A"
[20 Q. × 1=20 marks]

Choose the most appropriate option.

1. If the radiation intensity of an antenna is 5(W/unit solid angle) and total radiated power is 10W, then calculate the directivity of the antenna.
a) 2 b) 0.5 c) 6.28 d) 2.1
2. If radiation resistance of an antenna is 10Ω , loss resistance of the antenna is 1Ω and peak voltage of the generator is 20V, then calculate the maximum power radiated by the antenna during conjugate matching.
a) 6.17W b) 2W c) 3.75W d) 7.2W
3. As the frequency of a radio wave is increased, the critical angle must be.....
for refraction to occur.
a) increased b) equal to incidence angle
c) decreased d) greater than 90°
4. If gain of an antenna is 2, total input power to the antenna is 10W, then the radiation intensity in a given direction is (W/unit solid angle).
a) 1.59 b) 2.8 c) 20 d) 5
5. A fiber has the following characteristics: $n_1 = 1.35$ (core index) and $\Delta = 2\%$. Find the Numerical aperture.
a) 1.5 b) 7.1 c) 0.27 d) 0.532
6. Typically as the frequency increases aangle of radiation is needed to return the signals to earth. This means that higher frequencies tend to lead toskip distances.
a) lower, longer b) higher, longer
c) lower, smaller d) higher, smaller
7. Calculate the total phase difference of the fields from 5 adjacent sources at a large distance for end-fire array with increased directivity if the angle between array axis and distant point is 45° , wavelength of the radiated signal is λ and spacing between the sources is $\lambda/2$.
a) -1.548 b) 2.5 c) 1.21 d) 6.2

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18. Beverage antenna receives radio waves but it is suspended close to the ground, and requires some resistance in the ground to work.
a) VHF
b) horizontally polarized
c) vertically polarized
d) HF
19. The useful range of troposcatter is roughly 100 to....., and it can be used fromto 10 GHz.
a) 400m, 300MHz
b) 700m, 1GHz
c) 400km, 300MHz
d) 700 km, 144 MHz
20. A fiber has the following characteristics: $n_1 = 1.35$ (core index) and $\Delta = 2\%$. Find the acceptance angle.
a) 10.21°
b) 31.33°
c) 25.5°
d) 11.53°



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APR 03 2017

Level : B.E.
Year : IV
Time : 2 hrs. 30 mins.

Course : ETEG 402
Semester : I
F.M. : 55

SECTION "B"
[5 Q.×11=55 marks]

Attempt ANY FIVE questions.

1. a. Derive the expression for electric field of linear arrays of n isotropic sources of equal amplitude and spacing. Obtain the condition for end-fire array with increased directivity. [7]
- b. Obtain the equation of a wave travelling at speed 'c' in free space. [4]
2. a. Calculate the path difference in a Knife edge obstacle if the height of the obstacle in the line of sight of Tx and Rx is 2m, distance between Tx and obstacle is 50m, distance between Rx and obstacle is 40m and wavelength of the transmitted signal is 1m. [4]
- b. Derive the expression for retarded vector potential of the electric current and retarded scalar potential of a charge distribution for short dipole. [7]
3. a. 'Spiral antenna is a frequency independent antenna', justify this statement with mathematical expressions. [7]
- b. Calculate the normalized value of total electric field for 5 isotropic point sources of equal amplitude and spacing arranged as a linear array if the distance between each point sources is 1m, wavelength of the radiated signal is 2m, angle between distant point and array axis is 30° and phase difference of adjacent point sources is 10° . [4]
4. a. Derive the expression of refractive index and obtain the relation between power density and radiation intensity of nonmetallic dielectric lens antenna. [7]
- b. Differentiate the radiation pattern of vee and rhombic antenna. [4]
5. a. Explain the wave propagation by different layers of ionosphere. [4]
- b. Explain the path loss due to Knife edge obstacles and derive the relation of Fresnel-Kirchoff parameter to obtain normalized electric field at the receiver relative to LOS path. [7]
6. a. Obtain an equation of Friis transmission and explain how this equation is used to calculate the path loss in free space. [6]
- b. Write short notes on: (2×2.5) [5]
 - i) Half-power beamwidth
 - ii) Self impedance of an antenna

