

KATHMANDU UNIVERSITY
End Semester Examination [C]
June, 2018

JUN 13 2018

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

Course : PHYS 401
Semester : I
F.M. : 55

SECTION "B"

Attempt *ANY FIVE* questions.

1. a) A pelton turbine drives a three phase synchronous generator in a hydropower plant. Explain the energy conversion mechanism of generating electrical energy from the generator. [6]
b) Obtain the back emf equation of a dc machine. [5]
2. a) Explain the working principle of a dc to dc step up converter and obtain the expression linking output voltage, input voltage and duty cycle for the step up converter with suitable waveforms. [3+3]
b) Define the working principle of a half wave controlled rectifier for a resistive load and obtain the waveforms for output voltage, load current, source voltage and voltage across thyristor for the converter. [5]
3. a) What is an electrical breakdown? Explain the Townsend's breakdown criterion. [1 + 4]
b) Why does dispersion occur in multimode step-index fiber? Mention the solutions for modal dispersion in optical fiber communication. [3]
c) How do you estimate the band gap of a transparent thin film from the measured transmittance curve. [3]
4. a) Write stepwise methods for physical vapor deposition and plasma enhanced vapor deposition process with figure illustration. Write stepwise methods for physical vapor deposition and Plasma enhanced vapor deposition process with figure illustration. [2 + 2]
b) Distinguish between the following:
i. Spray pyrolysis and spin coating, polycrystalline and amorphous materials.
ii. Write short note on XRD technique for material characterization. How would you derive the crystallite size? (Give formula) [2 + 2]
c) Describe the process and information one can extract from scanning electron microscopy (SEM) and its importance in material's surface characterization. [3]
5. a) What are the properties of cast iron? Give the scheme of producing various forms of iron-carbon at equilibrium. Show the phase-transformation in Fe - C alloys. [4]
b) Draw loss versus wavelength graph and briefly explain about different transmission windows used in optical fiber communication system. [3]
c) Write the limitations and advantages of optical fiber communication. How is optical fiber useful in medical field? Explain [4]
6. a) A 220 V dc machine has an armature resistance of 0.5Ω . If the full load armature current is 20A, find the induced emf when the machine acts as
i) Generator.
ii) Motor. [2.5 + 2.5]
b) How can you derive a thin film's thickness from the measured transmittance curve? [Hint; Explain with figure and equation of the Swanepoel method]. [4]
d) Give the mechanism (process) of how the zinc oxide film is formed from zinc acetate precursor solution during spray pyrolysis process. [2]

