

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Marks Scored:

Level: B. Sc.

Year : IV

Exam Roll No. :

Time: 30 mins.

Course : PHYS 401

Semester : I

F. M. : 20

Registration No.:

Date FEB 18 2019

SECTION "A"

[20 Q. × 1 = 20 marks]

Encircle or provide the most appropriate answer:

- Carbon brushes are used in electric motors to
 - Prevent sparking during commutation.
 - Provide a path for flow of current.
 - Brush off carbon deposits on the commutator.
 - Provide rectification.
- Small dc motors upto 5 HP usually have
 - 2 poles.
 - 4 poles.
 - 6 poles.
 - 8 poles.
- The brush voltage drops in dc is of the order of
 - 2 V.
 - 10 V.
 - 20 V.
 - 40 V.
- The shaft torque of a dc motor is less than its armature torque because of
 - Copper losses.
 - Mechanical losses.
 - Back emf.
 - Rotational losses.
- Under constant load condition, the speed of a dc motor is effected by
 - Field flux alone.
 - Armature current alone.
 - Back emf.
 - Both armature current and field flux.
- Speed of the stator field of an induction motor is
 - Slip speed.
 - Synchronous speed.
 - Super synchronous speed.
 - Sub synchronous speed.
- Difference in between stator field and rotor is
 - Regulation.
 - Full load speed.
 - No load speed.
 - Slip.
- When the rotor is at standstill the slip is
 - Zero.
 - Unity.
 - Infinity.
 - Negative.
- A single phase 230V, 1 kW heater is connected across single phase, 230V, 50 Hz supply through SCR. For firing angle delay of 45° , power absorbed in heater element is
 - 250 Watts.
 - 500 Watts.
 - 1000 Watts.
 - 454.75 Watts.
- The no load speed for a 4 pole, 220V, 24 hp shunt dc motor with field current of 5A, armature resistance of 0.04 Ohm, field flux per pole of 40 mWb, 160 armature conductors with wave winding and no load current of 9 A is
 - 1500 rpm.
 - 1014 rpm.
 - 1030 rpm.
 - 1000 rpm.

11. What is the suitable value for profile parameter in graded index optical fiber?
 a. 1 b. 2 c. 3 d. 4
12. An optical fiber cable has specified refractive index values of 1.6 and 1.4 for the fiber core and the cladding respectively. The acceptance angle is _____
 a. 20.8° b. 30.8° c. 40.8° d. 50.8°
13. If the power launched is $1\mu\text{w}$ and receive sensitivity is $50\mu\text{w}$, the maximum transmission distance for a fiber link with an attenuation of 0.5 dB/km is _____
 a. 24 km b. 25 km c. 26 km d. 27 km
14. In *resistive heating physical vapor* thin film deposition technique (in particular, sputtering), one of following steps is mandatory:
 a. The inert gas collides with sputtering target and releases the sputtered target atom which deposit on the substrate
 b. The precursor solution is directly deposited on the substrate
 c. The precursor solution is spin casted on the substrate
 d. A vapor of sample is created by heating which deposits on the substrate
15. The major steps in chemical vapor deposition that causes to deposit good thin films are
 a. transport of reactants
 b. adsorption
 c. surface reaction and desorption of byproducts
 d. All of the mentioned
16. Analytical tool that is useful for studying surface morphology of the thin film and of powder nanomaterials) is
 a. Spectroscopic reflectometer b. Scanning Electron Spectroscopy (SEM)
 c. EDX d. XRD
17. An X-Ray diffraction (XRD) spectrum of a graphene oxide thin film, recorded with X-Ray of wavelength λ , found to have a peak with the full width at half maximum (FWHM) of value $B(2\theta)$. The appropriate relation for estimating the crystallite size in that film would be
 a. $B = 0.94 \lambda / \text{Cos}\theta$ b. $B = (B(2\theta)/\text{Cos}\theta).0.94 \lambda$
 c. $B = 0.94 \lambda / (B(2\theta)*\text{Cos}\theta)$ d. All of these are true.
18. Estimation of thickness from measured transmittance curve by using Swanepoel method requires the following input parameters:
 a. Maxima and minima of a transmittance curve and associated wavelength
 b. Transmittance values at the onset and off set of the curve
 c. Refractive indices of the analyte and substrate
 d. The parameters given in (a) and (c)
19. In plasma enhanced chemical vapor deposition, the role of plasma is:
 a. To produce temperature b. to produce vapor of the sample
 c. To help to break up gas molecules d. None of all
20. Major steps involved in spray pyrolysis deposition are
 a. creation of spray of the precursor solution
 b. decomposition of the precursor compound by thermal energy
 c. deposition of the desired product on the substrate
 d. All of the mentioned

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F. M. : 55

SECTION "B"

[5Q × 11 = 55 marks]

Attempt *ANY FIVE* questions

1.

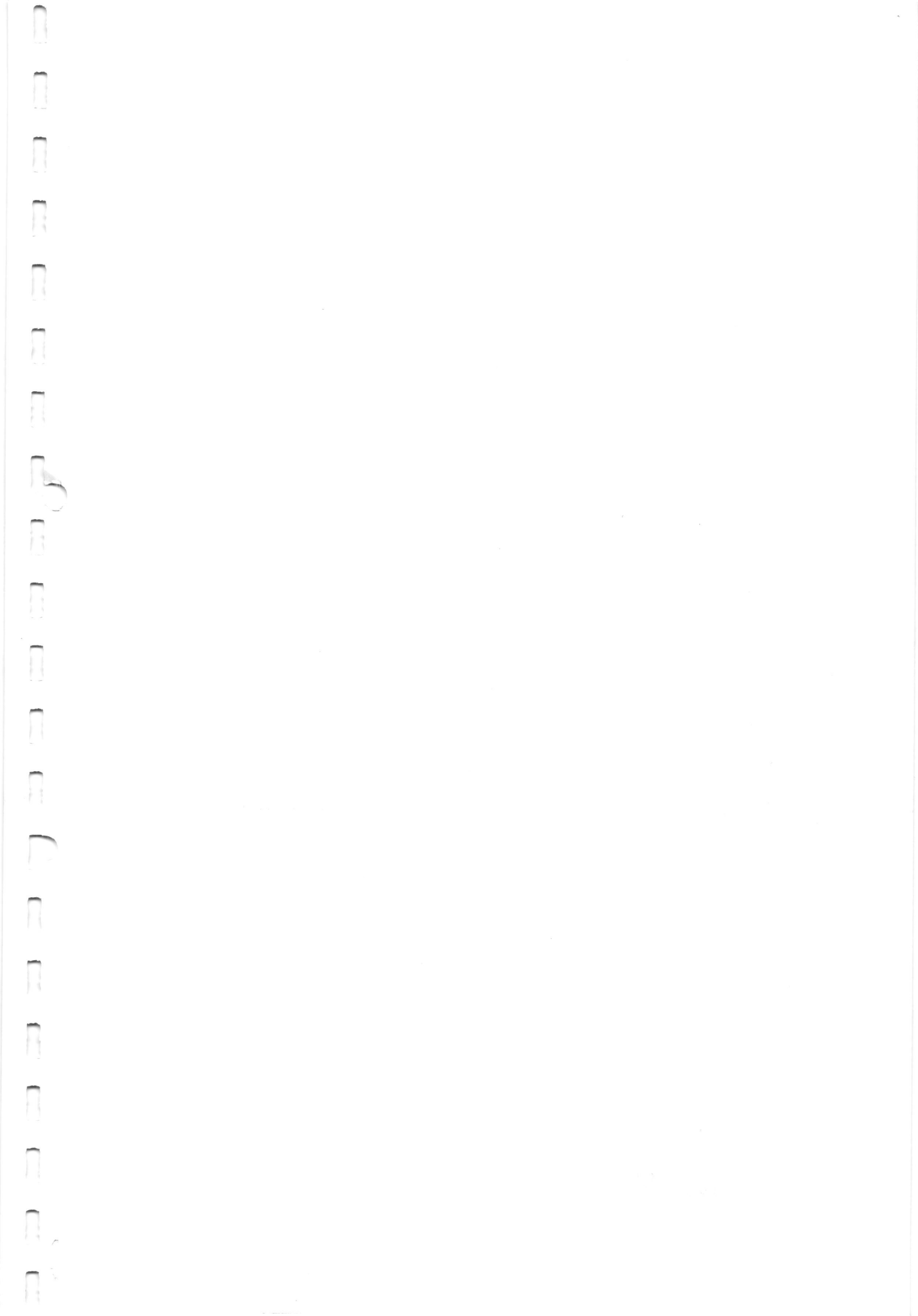
- A dc shunt generator has an induced voltage on open circuit of 250V. When the machine is on load, the terminal voltage is 220V. Find the load current if the field resistance is 10Ω and the armature resistance is 0.05Ω . [2]
- Obtain the emf equation of a dc machine i.e. $E = (P \phi Z N)/(60 A)$, where, E =emf of the generator, ϕ =flux/pole in Wb, Z = total number of armature conductors, P =number of poles, A = number of parallel path, N=armature speed in rpm. [4]
- Describe the working principle of a step up dc to dc converter with waveforms for an inductive load. [5]

2.

- A 50 kW, 480V dc shunt generator has armature and field resistances of 0.03Ω and 250Ω respectively. Calculate the total power developed by the armature when it delivers full load output. [3]
- Synchronous motors are not self-starting. Explain the process of obtaining uni-directional torque from a synchronous motor. [5]
- A 500 hp, 3 phase, 440 V, 50 Hz induction motor has a speed of 950 rpm on full load. The machine has 6 poles. Calculate the full load slip. How many cycles will the rotor voltage make per minute? [3]

3.

- Explain the difference between full wave uncontrolled rectifier and full wave controlled rectifier feeding resistive-inductive load, comparing waveforms of input voltage, output voltage, gate pulse for both the rectifiers. [6]
- Explain the v-i characteristic of a uni-junction transistor. [3]
- Explain the method of thermal breakdown in solid dielectrics. [2]



4.

- a. What is the cause of dispersion in optical fiber? Specify the reason for dispersion in each types of fiber. Also describe the effect and solution for the dispersion phenomenon. [5]
- b. Write stepwise methods for Physical vapor deposition, with an example of resistive heating with figure. [4]
- c. Distinguish between the following: [2]
 - i. Spin coating and Spray pyrolysis.
 - ii. Single crystalline, polycrystalline and amorphous materials.

5.

- a. How can you derive a band gap of a thin film from the measured transmittance Curve? Explain with necessary equation and well labeled diagram. [4]
- b. Describe the process and information one can extract from X-Ray diffraction crystallography. How would you derive the crystallite size with the help of measured XRD spectrum [Hint: Scherer's formula] [4]
- c. A graded index fiber has $NA=0.275$ and $N_1=1.487$. What is the bit rate restricted by modal dispersion for a 1 km length? [3]

6.

- a. Describe the process of chemical vapor deposition process with figure and example. [6]
- b. Interpret the role of optical fiber in medical field. Also describe the importance of optical sensor with relevant examples. [5]

