Marks Scored:

KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2018

Level: B. Sc. | Course : PHYS 401
Year : IV | Semester : I
Exam Roll No. : | Time: 30 mins. | F. M. : 20
Registration No.: | Date : FEB 27 2018

SECTION "A"
[20 Q. × 1 =20 marks]

Select the most appropriate answer:

1. The induced e.m.f in the armature conductors of a d.c motor is
   a. Sinusoidal b. Trapezoidal c. Rectangular d. Alternating

2. The largest percentage of heat loss in a d.c machine is due to
   a. Eddy current loss b. Hysteresis loss c. Copper loss d. Frictional loss

3. The electrical efficiency of a dc shunt generator (if V = terminal voltage, I_a =armature current, I_L =load current, I_{sh} = shunt field current and E_g =generated voltage) is
   a. $\frac{V*I_a}{E_g*I_a}$ b. $\frac{V*I_l}{E_g*I_a}$ c. $\frac{E_g*I_a}{V*I_a}$ d. $\frac{V*I_{sh}}{E_g*I_a}$

4. The efficiency of a d.c generator is its
   a. Electrical efficiency b. Mechanical efficiency
   c. Overall efficiency d. None of the above

5. The d.c machine has armature winding and field winding on
   a. Rotor and stator respectively b. Stator and rotor respectively
   c. Rotor only d. Stator only

6. For the same rating, a d.c machine has ..... an a.c machine.
   a. The same weight as b. More weight than
   c. Less weight than d. None of the above

7. The stator of a three phase induction motor when provided with electrical supply produces ..... magnetic field
   a. Steady b. Rotating c. Alternating d. Zero

8. When the rotor of a three phase induction motor is blocked, the slip is.....
   a. Zero b. 0.5 c. 0.1 d. 1

9. The frequency of e.m.f generated in an 8 pole alternator running at 900 r.p.m is.....
   a. 50 Hz b. 60 Hz c. 120 Hz d. 150 Hz

10. The maximum range of conduction angle for a single phase half wave controlled rectifier is.....
    a. 360^0 b. 180^0 c. 0^0 d. 90^0

11. The ..... dielectric material subjected to electric field above rated breakdown voltage damages permanently

12. Which of the following wavelength represents the centre wavelength used in first transmission window in optical fiber communication system?
a. 1550 nm b. 1310 nm c. 850 nm d. 650 nm

13. For a step index fiber v parameter is 26.6 at a wavelength of 1300 nm. What is NA if core radius is 25 μm?
a. 1.11 b. 0.11 c. 0.22 d. 2.22

14. If the power launched is 1 μW and receive sensitive is 50 μW, 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

15. For producing chips from nanomaterials, for example by computer chip manufacturers, manufacturers start from large bulk silicon wafers and then manufacture the devices on top of them through a series of printing, layering, doping and removal steps that ultimately lead to a functional device.
a. This method is known as "Bottom-up approach"
b. This method is known as "Top-Down approach"
c. This method is known as "Linear approach"
d. None of the above.

16. In the process of thin film deposition by sputtering method, film is prepared by the following process:
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.

17. The major parameters in spray pyrolysis process that causes to deposit good thin films are:
a. Substrate temperature,
b. Precursor concentration and the flow rate of the solution
c. Height between nozzle and substrate
d. All of the above.

18. What information can be obtained from X-Ray diffraction crystallography (XRD) about the nanomaterial based thin film?
a. crystallinity, crystallite size b. Surface morphology
c. Bandgap d. All of the above.

19. XRD spectrum of a ZnO thin film, recorded with X-Ray of wavelength λ found to have a peak with the full width half maximum (FWHM) B(2θ). Give the appropriate relation for estimating the crystallite size in that film is-
.....

20. Maxima and minima of a transmittance curve and refractive indices of the analyte and substrate are required for estimating the thin film's .....

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SECTION "B"
[5Q × 4 = 20 marks]

Attempt *ALL* the questions.

1. Describe stepwise method for spray pyrolysis process with a well labeled diagram.

2. Distinguish between the following: [2+2]
   a. Crystalline and amorphous materials
   b. Physical and chemical vapor deposition methods

3. How can you derive a band gap of a thin film from the measured transmittance curve? Explain with necessary theory.

4. Explain the methods for synthesis of thin film by sputtering method.

5. Differentiate between crystallites and grains of nanomaterials. What is the application of Scherer's formula in crystallography? How would you derive the crystallite size with the help of measured XRD spectrum?

SECTION "C"
[5Q × 7 = 35 marks]

6. a. Discuss about the treeing and tracking phenomenon of breakdown in solid dielectric. [4]
   b. A 100 kW, 240 V shunt generator has a field resistance of 55 ohm and armature resistance of 0.067 ohm, Find the full load generated voltage. [3]

7. a. Mention merits and demerits of d.c supply over a.c supply. [3]
   b. Explain the turning process of a thyristor with the aid of I-V characteristic curve. [4]

8. a. Explain the working principle of a Unijunction Transistor (UJT). [4]
   b. A 3 phase, 6 pole induction motor is connected to a 60 Hz supply. The voltage induced in the rotor bars is 4V when the rotor is standstill. Calculate the voltage and frequency induced in the rotor bars at 300 rpm. [3]

9. a. Explain principle and working of a synchronous motor. [3]
   b. What is a phase controlled rectifier? Sketch the output voltage and current waveform across the resistive load from a single phase full wave controlled rectifier for a firing angle of 45^0. [4]

10. a. Explain the impact of optical fiber in telecommunication system. [2+3+2]
    b. With the help of suitable diagrams, describe the use of optical fiber in medical field.
    c. A multimode step index fiber with a core diameter of 80 μm and a relative index difference of 1.5 % is operating at a wavelength of 0.85 μm. If the core refractive index is 1.48, estimate (a) the normalized frequency for the fiber (b) the number of guided modes.