SARDAR PATEL UNIVERSITY
F.Y.B.Sc. (FIRST SEMESTER) EXAMINATION (CBCS)
2010
SATURDAY, 20ᵀᴴ NOVEMBER
Time : 11.30 am To 01.30 pm
USO1CPHY02 (PHYSICS)
(Network Analysis, Optics and Laser)

Note : 1. Answers of all the questions (including multiple choice questions) should be written in the provided answer book only.
2. Figures to the right indicate the full marks of sub question.
3. Draw neat and labeled diagrams wherever necessary.

Maximum Marks : 70

Q. 1 Multiple Choice Questions(all questions are compulsory).   **(10)**

1. Every junction is a node but every node may not be a junction. The sentence is
    a. True   **b.** False   **c.** irrelevant   **d.** not clear

2. Superposition theorem is applicable to the networks in which current and voltage has
    a. linear relationship   **b.** exponential relationship **c.** parabolic relationship
    d. logarithmic relationship

3. In an AC bridge the null detector is usually
    a. an ammeter   **b.** a voltmeter   **c.** a galvanometer   **d.** a head phone

4. The inductive reactance of a coil(X_L) is given be the following equation
    a. $X_L = (1/2\pi)\, f\, L$ **b.** $X_L = 2\pi / f\, L$ **c.** $X_L = 2\,\pi\, f\, L$ **d.** $X_L = 2\pi f / L$

5. Wien Bridge is commonly used to measure the unknown
    a. Resistance **b.** Capacitance **c.** Inductance **d.** Frequency

6. Refractive Index(μ) for air is
    a. 1.0   **b.** 1.5   **c.** 1.25   **d.** 1.33

7. The formula for the resolving power of Prism is
    a. $(\lambda/d\lambda)=nN$ **b.** $(\lambda/d\lambda)=t(d\mu/d\lambda)$ **c.** $(1/d\theta)=a/(1.22\lambda)$ **d.** $d=1.22\lambda/(2\sin\alpha)$

8. B_{21} is Einstein's coefficient for
    a. stimulated absorption   **b.** spontaneous emission   **c.** stimulated emission
    d. none of these

9. Life time of excited level of CO_2 molecule is
    a. 0.5 millisecond **b.** 10^{-8} second **c.** 0.4 millisecond **d.** 10^{-3} second

10. A_{21} is Einstein's coefficient for
    a. stimulated absorption   **b.** spontaneous emission   **c.** stimulated emission
    d. none of these

P.T.O.

Q. 2 **Answer the following questions in short.(Any Ten – 2 marks each)** **(20)**

1. Define : Loop and Branch
2. With the help of necessary circuit diagram and equations explain the voltage divider theorem.
3. State and explain Superposition theorem.
4. Enlist the major sources of errors associated with Wheatstone Bridge measurements.
5. Explain the limitations of Maxwell's Bridge.
6. Explain how the heating effect of the current in resistors affect the wheatstone Bridge measurements.
7. Write a note on types of fringes obtained in Michelson's Interferrometer.
8. Along with the figure explain Rayleigh's criterion in brief.
9. Write only the formula for resolving power of Grating, Prism, Telescope and Microscope.
10. Enlist the methods of Pumping.
11. Write a short note on Population Inversion.
12. Discuss briefly the main components of LASER.

Q. 3 **a.** Analyse a network containing three meshes with the help of Mesh method of network analysis. **(05)**

 b. Discuss Norton theorem and compare its function with that of Thevenin's theorem. **(05)**

OR

Q. 3 **a.** Using the node-pair voltage method analyse a network containing two node-pairs. **(05)**

 b. State and prove Thevenin's theorem with the help of an example. **(05)**

Q. 4 **a.** Discuss the construction and working of Hay bridge with the help of necessary equations and circuit diagram. **(05)**

 b. Explain how Kelvin bridge removes the effects of connecting leads to provide an accurate measurement of low-value resistance. **(05)**

OR

Q. 4 **a.** Obtain the Thevenin equivalent circuit of a dc Wheatstone bridge and deduce the expression for the current flowing through the galvanometer. **(05)**

 b. Discuss construction and working of Scherring bridge in detail. **(05)**

Q. 5 a. Derive an expression for the resolving power of a telescope. **(05)**

b. Explain the principle, construction and working of Jamin's Refractometer.
(05)

OR

Q. 5 a. Explain the principle, construction and working of Michelson's Interferometer. **(05)**

b. Derive an expression for the resolving power of a Grating. **(05)**

Q. 6 a. With the help of necessary figure describe the construction and working of Nd : YAG LASER in detail. **(05)**

b. Write a detailed note on holography. **(05)**

OR

Q. 6 a. Describe the construction and working of a CO_2 LASER in detail. **(05)**

b. Give a detailed account of applications of LASER in material processing.
(05)

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