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SARDAR PATEL UNIVERSITY
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B. Sc. First Semester Examination (CBCS)

Subject: **Physics** Title: **Network Analysis, Optics and Laser** Course: **USO1CPHY02**
Date: 16-04-2016, Saturday Time: **02:30 pm to 04:30 pm** Total Marks: **70**

Q.1 Answer the following questions with the correct choice. (Each of 1 Mark.) **(10)**

(1) Which of the followings is a closed path of a network?
(a) node (b) junction (c) branch (d) mesh.

(2) In a network, the point where two or more circuit elements are joined is known as ..... .
(a) branch (b) junction (c) node (d) mesh

(3) Which of the following bridges use galvanometer as a detector?
(a) Wien (b) Wheatstone (c) Maxwell (d) Hay

(4) Which of these bridges is used to determine capacitance of a capacitor?
(a) Schering bridge (b) Kelvin bridge (c) Hay bridge (d) Maxwell bridge

(5) The resolving power of the prism depends
(a) only on base thickness (t) (b) only on refractive index (μ)
(c) only on wavelength of light (λ) (d) on both (t) and ($d\mu/d\lambda$)

(6) For a transmission grating, as spectrum order (n) increases, resolving power....
(a) becomes infinite (b) decreases (c) increases (d) remains unchanged

(7) Which of these is not a property of lasers?
(a) high chromacity (b) weak coherence
(c) high intensity (d) high directionality

(8) Which pumping method is used in Nd:YAG laser?
(a) optical (b) chemical (c) in elastic collision (d) direct

(9) How many number of independent node equations are required to analyze a network having three junction point?
(a) 1 (b) 2 (c) 3 (d) 4

(10) What is used as a source of excitation in an ac bridge?
(a) headphone (b) galvanometer (c) oscillator (d) battery

Q.2 Answer any TEN. (Each of 2 Mark.) **(20)**

(1) State Superposition principle and explain its importance.

(2) Draw circuit of a three mesh network and explain its components.

(3) Draw the circuit of ac bridge and state expressions for its balancing conditions.

(4) State various sources of errors in Wheatstone bridge measurements.

(5) Explain Rayleigh's criterion for just resolved images. .

(6) There are total N = 25,000 lines ruled on a plane transmission grating. Determine its resolving power in the second order (i.e. n=2).

(7) What is a LASER? State properties of lasers.

(8) What is population inversion? Explain.

(9) A series circuit consists of a battery of 12V and three resistors $R_1 = 20\ \Omega$, $R_2 = 60\ \Omega$ and $R_3 = 40\ \Omega$. Find voltage across R_2 .

(10) A Wheatstone bridge is balanced with arm AB with 300 Ω resistor, arm BC with 600 Ω resistor, arm DA with a 400 Ω resistor and arm CD with resistor R_x. Find the value of R_x .

(11) In a Jamin's refrectometer, 600 fringes cross the field of view when a gas sample is filled in one of its tubes of 20cm length. The light used is of 5896Å. Determine the refractive index of the gas sample filled in the tube.

(12) For lasers, what is a spontaneous absorption? On what factors it depends?

(P.T.O.)

Q.3 (a)	What is a node of network? With a suitable diagram explains nodal or node pair method for analysis of a two node pair network.	**(5)**
(b)	Write a note on: Thevenin's theorem.	**(5)**

OR

Q.3(a)	What is a network? With a suitable diagram explains various network terms i.e. network terminology.	**(5)**
(b)	Define mesh current and with proper diagram explain analysis of a two mesh network using mesh current method.	**(5)**
Q.4(a)	Why Hay bridge is required? With necessary diagram explain its construction and working.	**(5)**
(b)	What is a Maxwell bridge? With necessary diagram explain its working. State its limitations.	**(5)**

OR

Q.4(a)	What is a Wein Bridge? With necessary diagram explain its working.	**(5)**
(b)	Write a note on Schering bridge.	**(5)**

Q.5(a)	What is interferometer? State principle of Michelson interferometer. With proper diagram explain construction and working of a Michelson interferometer. Discuss types of fringes obtained using Michelson interferometer.	**(10)**

OR

Q.5(a)	Define resolving power of an optical instrument and resolving power of a prism. With proper diagram derive expression for resolving power of a prism and explain the factors on which it depends.	**(10)**
Q.6(a)	Explain spontaneous emission and stimulated emission of radiation.	**(5)**
Q.6(a)	What is "pumping"? State various methods for pumping in a laser and discuss optical pumping.	**(5)**

OR

Q.6(a)	Draw and explain construction of Nd: YAG laser. State any three of its features.	**(5)**
Q.6(a)	State main components of a laser. Mention various applications of lasers and discuss any two applications in detail.	**(5)**

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