

B**8027**Register
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Part III — PHYSICS

(English Version)

Time Allowed : 3 Hours]

[Maximum Marks : 150

PART - I*N. B. :* i) Answer *all* the questions.

ii) Choose and write the correct answer.

iii) Each question carries *one* mark. $30 \times 1 = 30$

1. Which of the following principles is used in a thermopile ?

a) Thomson effect

b) Peltier effect

c) Seebeck effect

d) Joule's effect.

2. An ideal voltmeter has

a) zero resistance

b) finite resistance between zero and G c) resistance greater than G but less than infinity

d) infinite resistance.

3. Transformer works on

a) AC only

b) DC only

c) both AC and DC

d) AC more effectively than DC.

[Turn over

PART - II

N. B. : Answer any *fifteen* questions.

15 × 3 = 45

31. Write the applications of capacitor.
32. What do you mean by "Additive nature of charge" ? Give an example.
33. State Ohm's law.
34. The resistance of a Nichrome wire at 0°C is 10 Ω . If its temperature co-efficient of resistance is 0.004/°C, find its resistance at boiling point of water.
35. Mention any three applications of super-conductors.
36. Calculate the resistance of the filament of a 100 W, 220 V electric bulb.
37. Why can a d.c. ammeter not read a.c. ?
38. State Faraday's laws of electromagnetic induction.
39. Distinguish between interference and diffraction fringes.
40. A light of wavelength 5890 Å falls normally on a thin air film. 6 dark fringes are seen between two points. Calculate the thickness of the air film.
41. What is hologram ?
42. Write down the two important facts of the Laue experiment on X-ray diffraction.
43. State the postulates of special theory of relativity.
44. The half-life of ${}_{84}\text{Po}^{218}$ is 3 minutes. What percentage of the sample has decayed in 15 minutes ?
45. What is the use of a control rod in the reactor ? Mention any two control rods.
46. What are the advantages of negative feedback ?
47. Give the Barkhausen criteria for oscillations.

48. Give the important parameters of an operational amplifier.
49. The outputs of two NOT gates are NORed, as shown in the figure. What is the logic operation performed ?



50. What is the necessity of modulation ?

PART - III

- N. B. : i) Answer Question No. 56 compulsorily.
 ii) Answer any six of the remaining 11 questions,
 iii) Draw diagrams wherever necessary.

7 × 5 = 35

51. Write the properties of electric lines of force.
52. Explain the principle of a potentiometer.
53. Explain the action of lead-acid accumulator.
54. A long straight wire carrying current produces a magnetic induction of 4×10^{-6} T at a point 15 cm from the wire. Calculate the current through the wire.
55. Explain how an e.m.f. can be induced by changing the area enclosed by the coil.
56. A soap film of refractive index 1.34, is illuminated by white light incident at an angle 30° . The reflected light is examined by a spectroscope in which dark band corresponding to the wavelength 5893 \AA is found. Calculate the smallest thickness of the film.

OR

In Young's experiment a light of frequency 6×10^{14} Hz is used. Distance between the centres of adjacent fringes is 0.75 mm. Calculate the distance between the slits, if the screen is 1.5 m away.

57. Prove that the energy of an electron for hydrogen atom in the n^{th} orbit is

$$E_n = \frac{-me^4}{8\epsilon_0^2 n^2 h^2}$$

58. Explain the wave mechanical concept of atom.
59. How fast would a rocket have to go relative to an observer for its length to be corrected to 99% of its length at rest ?
60. Explain the latitude effect of cosmic rays.
61. Explain the function of a transistor as a switch.
62. Draw the block diagram of AM radio transmitter.

PART - IV

N. B. : i) Answer any *four* questions in detail.

ii) Draw diagrams wherever necessary.

4 × 10 = 40

63. Deduce an expression each for the equivalent capacitance of capacitors connected in (i) series and (ii) parallel.
64. Deduce the relation for the magnetic induction at a point along the axis of a circular coil carrying current.
65. Describe the principle, construction and working of a single phase A.C. generator.
66. Explain the Raman scattering of light with the help of energy level diagram.
67. Explain the working of Ruby laser with neat sketch.
68. Explain the construction and working of a Geiger-Müller counter.
69. Explain the action of an operational amplifier as difference amplifier.
70. With the help of a block diagram, explain the function of a RADAR system.