

AE-751

M.Sc. (Final)
Term End Examination, 2016-17

PHYSICS

Optional

Paper - II (B)

Numerical Methods and Physics
of Laser and Laser Applications

Time : Three Hours] [Maximum Marks : 100
[Minimum Pass Marks : 36

Note : Answer **five** questions in all, selecting at least **two** questions from each Section. All questions carry equal marks.

Section-A

1. Derive Newton-Raphson formula and show that the Newton-Raphson process has a second order or quadratic convergence.

(2)

2. Explain in brief Gauss elimination method and find out the solution of the following equations :

$$\begin{aligned} 2x + 4y - 6z &= -4 \\ x + 5y + 3z &= 10 \\ x + 3y + 2z &= 5 \end{aligned}$$

3. Compute the values of $f'(3.1)$ and $f'(3.2)$ using the following table :

x	1	2	3	4	5
$f(x)$	0	1.4	3.3	5.6	8.1

4. Derive Simpson's 1/3-rule using the method of undetermined coefficients.

5. Find the best values of a_0 and a_1 if the straight line $y = a_0 + a_1x$ is fitted to the data (x_i, y_i) ; (1, 0.6), (2, 2.4), (4, 4.8) and (5, 5.7). Also find the correlation coefficient.

Section-B

6. What is Laser ? Explain in brief the structure, working and applications of semiconductor laser diode.

7. Explain in brief the principle of light propagation in a medium with variable refractive index and write its merits and demerits.

(3)

- 8.** Write short notes on the following :
 - (a) Nd-YAG laser
 - (b) Laser cavity
- 9.** Explain in brief the effect of non-linear interaction of light with matter and give the necessary theory.
- 10.** What do you mean by Mode Locking Technique in Laser ? Describe its types and give the energy band diagram, equations for three-level and four-level laser system.
