

Roll No. :

Total No. of Questions : 11]

[Total No. of Printed Pages : 3

BPMS-532

M.Sc. (Previous) Examination, 2023

PHYSICS

Paper - IV

(Electronic Devices, Computational Methods and Programming)

Time : 3 Hours]

[Maximum Marks : 75

Section-A

(Marks : 2 × 10 = 20)

Note :- Answer all *ten* questions (Answer limit **50** words). Each question carries **2** marks.

Section-B

(Marks : 5 × 5 = 25)

Note :- Answer all *five* questions. Each question has internal choice (Answer limit **200** words). Each question carries **5** marks.

Section-C

(Marks : 10 × 3 = 30)

Note :- Answer any *three* questions out of five (Answer limit **500** words). Each question carries **10** marks.

Section-A

1. Attempt all questions :

- (i) Draw *p*-channel JFET and apply the proper biasing between drain and source and sketch the depletion region for $V_{GS} = 0$ V.
- (ii) Give difference between radiative and non-radiative transitions.

BRI-753

(1)

BPMS-532 P.T.O.

- (iii) What are charge coupled devices ?
- (iv) Explain Electro-optic effect.
- (v) Name *two* materials exhibiting magneto strictive effects.
- (vi) Give formula for Bisection method.
- (vii) Explain, what is Double Interpolation ?
- (viii) Give error estimate for trapezoidal rule.
- (ix) Write Runge-Kutta method for a differential equation.
- (x) Mention difference between Integer and Floating point.

Section-B

2. Describe why I_G is effectively zero amperes for a JFET transistor and why is the terminology field effect appropriate for this three terminal device. Also explain why is input impedance to a JFET so high.

Or

Explain the working principle of photoconductive cell. What are its major drawbacks ?

3. Explain the functions of SRAM and DRAM. Why is SRAM better than DRAM ?

Or

What is magneto-optic effect ? Explain the working principle of a magneto-optic device.

4. Write a short note on Acoustic delay lines.

Or

Find a real root of the equation $f(x) = x^3 - x - 1 = 0$ using bisection method.

5. Using Newton's forward difference formula find the sum $S_n = 1^3 + 2^3 + 3^3 + \dots + n^3$

Or

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

6. Given $\frac{dy}{dx} - 1 = xy$ and $y(0) = 1$, obtain the Taylor series for $y(x)$ and compute $y(0, 1)$ correct to four decimal places.

Or

What is a flow chart ? Explain basic components of flow-chart with an example.

Section-C

7. What is the significant difference between the construction of an enhancement type MOSFET and a depletion type MOSFET. Describe the basic operation of Enhancement type MOSFET. Sketch its characteristic curve.
8. Describe the construction and working of solar cell. Derive expression for optimum load resistance and fill factor.
9. What is meant by absolute and relative errors ? If $y = \frac{0.31x + 2.73}{x + 0.35}$, where the coefficients are rounded off, find the absolute and relative errors in y when $x = 0.5 \pm 0.1$.
10. (a) The function $y = \sin x$ is tabulated below :

x	$y = \sin x$
0	0
$\pi/4$	0.70711
$\pi/2$	1.0

Using Lagrange's interpolation formula, find the value of $\sin(\pi/6)$.

- (b) Estimate the error in the solution computed above.
11. Write short notes on the following :
- (a) Interpreters and Compilers
- (b) Operating System
- (c) Executable and Non-executable statements