

(20518)

Roll No.

BCA- II Sem.

18010

B. C. A. Examination, May 2018

MATHEMATICS-II

(BCA-201)

(New)

Time : Three Hours

[Maximum Marks : 75

Note : Attempt questions from all Sections as per instructions.

Section-A

(Very Short Answer Questions)

Attempt all the *five* questions. Each question carries 3 marks. Very short answer is required.

3×5=15

1. Define the following with examples : 3
 - (i) Proper subset
 - (ii) Complement of a set
 - (iii) What is the set $\{x : x \in R, x^2 = 9, 2x = 4\}$?

(2)

2. Let $f : A \rightarrow B$ such that $f(x) = x - 1$ and $g : B \rightarrow C$ such that $g(y) = y^2$. Find $f \circ g(y)$. 3
3. Show that a linearly ordered poset is a distributive lattice. 3
4. If $u = \tan^{-1}\left(\frac{y}{x}\right)$, show that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$. 3
5. Evaluate $\int_0^{\pi/2} \int_0^{\sin \theta} r d\theta dr$. 3

Section-B

(Short Answer Questions)

Attempt any *two* questions out of the following three questions. Each question carries 7½ marks. Short answer is required. 7½×2=15

6. Show that the direction cosines of a line whose direction ratios are a, b, c are : 7½

$$\frac{a}{\sqrt{a^2 + b^2 + c^2}}, \frac{b}{\sqrt{a^2 + b^2 + c^2}}, \frac{c}{\sqrt{a^2 + b^2 + c^2}}$$
7. In a group of 50 people, 35 speak Hindi, 25 speak both English and Hindi and all people speak at least one of the two languages. How many people speak only English and not Hindi? How many speak English? 7½

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8. Show that $\sin x(1 + \cos x)$ is a maximum at $x = \frac{\pi}{3}$. 7½

Section-C

(Detailed Answer Questions)

Attempt any *three* questions out of the following five questions. Each question carries 15 marks.

Answer is required in detail. 15×3=45

9. Find the acute angle between two lines whose direction cosines are given by the relation $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$. 15

10. Change the order of integration : 15

$$\int_0^a \int_x^{a^2/x} \phi(x, y) dx dy.$$

11. (a) Evaluate $\int_0^a \int_0^{a-x} \int_0^{a-x-y} x^2 dx dy dz$. 7½

- (b) Evaluate $\int_0^1 \int_0^{x^2} e^{y/x} dx dy$. 7½

12. (a) Find the shortest distance between the lines: 7½

$$\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ and } \frac{x-2}{3} = \frac{y-4}{4} = \frac{z-5}{5}$$

- (b) Show that the plane $2x - 2y + z + 12 = 0$ touches the sphere $x^2 + y^2 + z^2 - 2x - 4y + 2z - 3 = 0$.

7½

13. (a) Transform the equation $x^4 \left(\frac{d^2 y}{dx^2} \right) + a^2 y = 0$

by the substitution $x = \frac{1}{z}$. 7½

- (b) If $f(x) = \log \left(\frac{1+x}{1-x} \right)$, show that : 7½

$$f(x) + f(y) = f \left(\frac{x+y}{1+xy} \right).$$