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(20524) Roll No. ....

BCA-II Sem.

18010

B.C.A. Examination, May-2024

MATHEMATICS-II

(BCA-201)

Time : Three Hours] *[Maximum Marks : 75*

Note : Attempt **all** the sections as per instructions.

Section-A

Note : Attempt **all** the **five** questions. Each question carries **3** marks. 5x3=15

1. Define complement of a set with example.

2. Define equivalence Relations and partial order Relation function.

3. State and prove Euler's theorem on Homogenous function.

P.T.O.

4. Draw the Harse diagram for the partial ordering {[A,B], A⊆B} on the power set P(S) for S={1,2,3}.

5. Evaluate $I = \int_{1}^{2}\int_{3}^{4}(xy + e^{y})\,dy\,dx$

Section-B

Note : Attempt any **two** questions.

7.5×2=15

6. Show that the lines $\frac{x+3}{2} = \frac{y+5}{3} = \frac{z-7}{-3}$ and $\frac{x+1}{4} = \frac{y+1}{5} = \frac{z+1}{-1}$ are coplanar. Find the equation of the plane containing them.

7. Change the order of integration in the following integral and evaluate $\int_{0}^{49}\int_{x^2/49}^{2\sqrt{ax}} dy\,dx$

8. If f, g, h are three functions s.t. (fog)oh and fo(goh) exist then (hog)of=ho(gof) or, the composition of function is not necessarily commutative.

Section-C

Note : Attempt any **three** questions.

$15\times3=45$

9. (i) Show that dual of a lattice is a lattice.

   (ii) If $(L, \leq)$ be a lattice with operation $\vee$ and $\wedge$ then for any $a, b \in L$ show that

   (i) $a\leq b \Rightarrow a\wedge b = a$

   (ii) $a\leq b \Rightarrow a\vee b = b$

10. (i) If $u = \sin^{-1}\frac{x}{y} + \tan^{-1}\frac{y}{x}$ show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = 0$

    (ii) Find the maxima or minimum values of the function $x^3y^2(1-x-y)$

11. (i) Find the length and equation of shortest distance between $3x-9y+5z=0=x+y-z$ and $6x+8y+3z-13=0=x+2y+z-3$

    (ii) Find the eq^n of the sphere which touches the sphere $x^2+y^2+z^2+2x-6y+1=0$ at $(1, 2, -2)$ and passes through the point $(1, -1, 0)$.

12. (i) Show that $\iiint x^2yz\,dx\,dy\,dz = \frac{1}{2520}$. The region of integration being the volume enclosed by the region $x\geq0$, $y\geq0$ and $z\geq0$ and $x+y+z\leq1$

    (ii) For any sets A and B define $AB=\{ab, a\in A \wedge b\in B\}$ if $A=\{1, 2\}$ and $B=\{2,3,4\}$ what is $|AB|=2$. What is $|A\times B|=?$

13. (i) Show that whether the relation $(x,y)\in R$, if $x\geq y$ defined on the set of positive integers is a partial order relation.

    (ii) If $z = x^2\tan^{-1}\left(\frac{y}{x}\right) - y^2\tan^{-1}\left(\frac{y}{x}\right)$ then prove that $\frac{\partial^2 z}{\partial y\,\partial x} = \frac{x^2-y^2}{x^2+y^2}$