BCA (SEM - II)

Important Questions of Mathematics - II / BCA-205(N)

① If $u = \sin^{-1}(x/y) + \tan^{-1}(y/x)$, then find the value of $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y}$.

② Evaluate $\displaystyle\int_0^1 \int_0^{\sqrt{1+x^2}} \frac{dx\,dy}{1+x^2+y^2}$

③ Give a brief description of various Set Theoretical Operations and laws of Set Theory.

④ If R be a relation in the set of integer I defined by $R = \{(x,y) : x \in I, y \in I, x-y = 5k$ or $x-y\}$ is divisible by $5\}$.
Prove that R is an equivalence relation.

⑤ Give an example of relation which is :
ⓐ Reflexive and transitive but not symmetric.
ⓑ Symmetric and transitive but not reflexive.
ⓒ Reflexive and symmetric but not transitive.
(4) Reflexive and transitive but neither symmetric nor antisymmetric

⑥ Let $A = \{1, 2, 3, 4\}$ and $R = \{(1,2), (2,3), (3,4), (2,4)\}$.
Find transitive closure of R.

⑦ Prove that if R is an equivalence relation on set A then R^{-1} is also an equivalence relation on A.

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

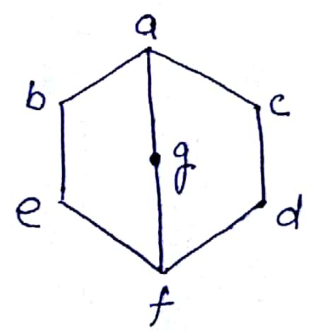
$$f(x) + f(y) = f\left(\frac{x+y}{1+xy}\right)$$

(9) Consider the set $N \times N$, the set of ordered pairs of natural numbers. Let R be a relation in $N \times N$ which is defined by $(a,b) R (c,d)$ iff $ad = bc$. Prove that R is an equivalence relation.

(10) Define distributive lattice and prove that in a distributive lattice, if an element has a complement, then this complement is unique.

(11) Draw the Hasse diagrame of $(A, \leq)$, where $A = \{3, 4, 12, 24, 48, 72\}$ and relation $\leq$ be such that $a \leq b$ if a divides b.

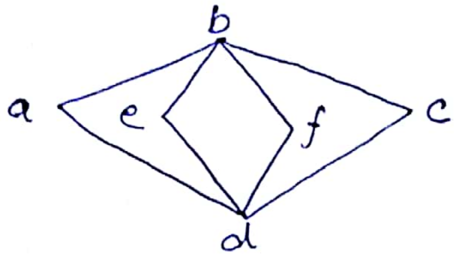
(12) Determine whether the given Hasse diagram represents a complement lattice or not?



(13) Let $D(81)$ be the set of all positive divisors of 81, then show that $D(81)$ under the binary relation 'divides' is a poset. Is the poset totally ordered?

(14) ~~Let~~ Show that dual of a lattice is a lattice.

(15) Show that the lattice L represented by diagram is complemented but not distributive



(16) If $u = \tan^{-1}\left(\frac{x^3+y^3}{x+y}\right)$, show that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \sin 2u$$

(17) If $z = e^u f(v)$

$u = ax + by$ & $v = ax - by$.

Show that : $b\frac{\partial z}{\partial x} + a\frac{\partial z}{\partial y} = 2abz$.

(18) State and prove Euler's Theorem.

(19) If $u = e^{xyz}$; show that :

$$\frac{\partial^3 u}{\partial x\,\partial y\,\partial z} = (1 + 3xyz + x^2y^2z^2)\,e^{xyz}$$

(20) Discuss that maxima and minima of $u = xy(1-x-y)$

(21) Show that the lines whose directions cosines are given by the equations $2l + 2m - n = 0$ and $mn + nl + lm = 0$ are at right angle.

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(22) Find the equation to the sphere through the circle:

$$x^2+y^2+z^2=9 \quad , \quad 2x+3y+4z=5$$

and the point $(1,2,3)$.

(23) Prove that the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ are coplanar. Find their point of intersection. Also find the equation of the plane in which they lie.

(24) Find the equation of the plane through the line of intersection of the planes $ax+by+cz+d=0$ and $\alpha x+\beta y+\gamma z+\delta=0$ parallel to x-axis.

(25) The projection of a line on axis are $5, 10, 10$. Find the length and direction cosines.

(26) Evaluate $\int_{x=0}^{2}\int_{y=0}^{3}\int_{z=0}^{1}(x+y+z)\,dx\,dy\,dz$.

(27) Find the area between the parabola $y^2=4ax$ and $x^2=4ay$.

(28) Evaluate $\iiint(z^5+5)\,dx\,dy\,dz$ over the sphere $x^2+y^2+z^2=1$.

(29) Evaluate $\int_0^1\int_0^2(x+y)\,dx\,dy$

(30) Change the order of integration in $\int_0^1\int_{\sqrt{x}}^{1} e^{x/y}\,dx\,dy$ & hence find it's value