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EM-3704

First Year B. C. A. (Sem. I) Examination

November / December - 2016

Mathematics : Paper - 102

Time : 3 Hours] [Total Marks : 70

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ FIRST YEAR B. C. A. (SEM. 1)

Name of the Subject :

☛ MATHEMATICS : PAPER - 102

☛ Subject Code No. : 3 7 0 4 ☛ Section No. (1, 2.....) : 1&2

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks.

1 Answer the following questions : 10

(1) Define subset of a set with illustration.

(2) Explain Cartesian product of two non-empty sets with illustration.

(3) Define demand and supply function with illustration.

(4) Define one-one function with illustration.

(5) Find $f(2)-f(0)$ for $f(x)=x^2+2^x$.

(6) Define Domain of the function and find D_f for $f(x)=x^2-2,\ R_f=\{-1,1\}$.

(7) Define symmetric matrix with illustration.

(8) Define Diagonal matrix with illustration.

(9) State principal of duality in Boolean algebra.

(10) Define Boolean function with illustration.

2 (a) State and prove distributive law of union over intersection. 5

OR

(a) State and prove De Morgan's law of union. 5

(b) Attempt any two : 10

(1) If $A=\{x/x\leq 3; x\in N\}$, $B=\{x/1<x<5; x\in N\}$ and $C=\{x/x$ is an even positive interger less than 10$\}$ then verify that $A\cap(B-C)=(A\cap B)-(A\cap C)$.

(2) If $A=\{x\leq 3; x\in N\}$ $B=\{x:1\leq x\leq 2; x\in Z\}$ and $C=\left\{x:x^2-5x+6; x\in R\right\}$ considering $U=R$, verify DeMorgan's law for union.

(3) Verify $A\times(B\cap C)=(A\times B)\cap(A\times C)$ for $A=\{5,6,7\}$, $B=\{7,8\}$, $C=\{5,8\}$.

(4) In a college there are 500 girls and of them 300 have taken Economics and 250 have taken Mathematics. How many of them have taken both the subjects ? All girls have taken at best one of these of two subjects.

3 If $f(x)=\dfrac{x^2-9}{x-3}$ where $x\in Z-\{3\}$ and $g(x)=x+3$, $x\in Z$, are the functions equal ? 5

OR

3 (a) If $f(x)=x(x+1)(2x+1)$, then prove that $f(x)-f(x-1)=6x^2$. 5

(b) Attempt any **two** : **10**

(1) Examine whether the following functions are equal or not.

$f(x)=\frac{x^3+1}{x+1}, x\in Z-\{-1\}$ and $g(x)=x^2-x+1, x\in Z$

(2) If $f(x)=\frac{x(x+1)}{x-2}$ then find $f(0)+f(-1)+f(-3)$.

(3) If $f(x)=x^3-2x+\frac{1}{x}$ then find $f(x)+f(-x)$.

(4) The demand function of a commodity is $x=\frac{50-2p}{3}$, find the revenue function, also find the Revenue, when the demand is of 10 units.

4 (a) Show that D_{10} is a Boolean Algebra where $\forall a, b\in D_{10}$. **5**

$a+b=$ L.C.M. of a, b

$a\cdot b=$ G.C.D. of a, b

$a'=10/a$

OR

(a) Check the validity of the following argument : **5**

Hypothesis : $\begin{cases} S_1 : p\Rightarrow(\sim q) \\ S_2 : r\Rightarrow p \\ S_3 : r \end{cases}$ Conclusion : $S:(\sim p)$

(b) Attempt any **two** : **10**

(1) Using Truth table prove that

(i) $\sim(p\vee q)=[(\sim p)\wedge(\sim q)]$

(ii) $\sim(p\wedge q)=(\sim p)\vee(\sim q)$

(2) Construction the input / output table for

(i) $f(x)=(x_1, x_2, x_3)=(x_1\cdot x_2)'\cdot x_3$

(ii) $f(x)=(x_1, x_2)=(x_1\cdot x_2)'+x_2$

(3) Find the product sum canonical form of $f(x_1, x_2)=x_1\cdot x_2+x_1'\cdot x_2+x_1\cdot x_2'$

(4) Using Truth table that $p\wedge(p\vee r)=(p\wedge q)\vee(p\wedge r)$.

5 (a) $A=\begin{pmatrix}5 & -4 & 0\\ 2 & -2 & 1\\ 1 & 1 & 3\end{pmatrix}$; $B=\begin{pmatrix}-2 & 2 & 3\\ 8 & 5 & 0\\ 1 & 1 & -2\end{pmatrix}$ verify that **5**

(i) $(A+B)^T = A^T + B^T$

(ii) $(A\cdot B)^T = A^T \cdot B^T$

OR

(a) If $A=\begin{pmatrix}1 & 0 & 7\\ 2 & 2 & 5\\ 0 & 3 & 6\end{pmatrix}$ then obtain adj.A and A × (adj.A)

(b) Attempt any **two** : **10**

(1) Solve the following system of equations using Crammer's rule :

$3x+5y+6z=4$

$x+2y+3z=2$

$2x+4y+5z=3$

(2) If $A=\begin{pmatrix}7 & 3 & 5\\ 0 & 3 & 2\\ 1 & 5 & 4\end{pmatrix}$, $B=-A$ and $C=-2B$ then find $2A+B+C$.

(3) Show that D_{21} is a Boolean Algebra where $\forall a, b \in D_{21}$.

$a+b=$ L.C.M. of a, b

$a\cdot b=$ G.C.D. of a, b

$a' = 21/a$

(4) If $A=\begin{pmatrix}1 & 2 & 1\\ 0 & 1 & -1\\ 3 & -1 & 1\end{pmatrix}$ then find $A^2-5A+3I$.
