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JA-3702

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

March/April – 2013

102 - Mathematics

(New Course)

Time : 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 :
☛ **F. Y. B. C. A. (Sem. 1) (CBCS)**

Name of the Subject :
☛ **102 - Mathematics (New Course)**

☛ Subject Code No. : **3 7 0 2** ☛ Section No. (1, 2,.....) : **NIL**

Seat No. :

Student's Signature

(2) All questions are compulsory.

(3) Figures to right indicate full marks.

1 Objectives : **10**

(1) Write the set of all Vowels in English alphabets which precede S.

(2) Define equivalent set with illustration.

(3) Define cost function with illustration.

(4) Define supply function with illustration.

(5) Define singular matrix with illustration.

(6) Define co-factors and minor.

(7) Define Improper subset.

(8) In a Boolean algebra show that 0' = 1 and 1' = 0.

(9) Define Improper subset with illustration.

(10) Define principle of Duality in Boolean algebra.

2 (a) State and prove De Morgan's law for Union and intersection. **5**

OR

(a) In Usual notations prove that,

$$A\times(B\cap C)=(A\times B)\cap(A\times C)$$

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

(1) If $A=\{x\mid x\in N;\ 2<x<6\}$, $B=\{x\mid x\in N;\ x^2<5x\}$ then prove that $(A\cap B)'=A'\cup B$ and $(A\cup B)'=A'\cap B'$.

(2) If $A=\{1,2,3,4\}, B=\{3,4,5\}, C=\{1,3,5\}$ then verify that :

(i) $A\cup B=(A-B)\cup B$

(ii) $A\times(B\cup C)=(A\times B)\cup(A\times C)$.

(3) In a class of 35 students, 17 have taken maths, 10 have not taken economics but maths. Find the number of students who have taken both and the number of students who have taken economics but not Maths. It is given that each student has taken either maths or economics.

(4) If $U=\{1,2,3,4,5,6,7,8\}$, $A=\{1,2,3,4\}$ $B=\{2,4,6\}$ **5**

$C=\{1,2,5\}$ then find :

(i) $A'\cup(B-C)$

(ii) $A-(B'-C')$.

3 (a) If the demand function is $x=\dfrac{50-2p}{3}$ find the revenue function. **10**

OR

(a) The supply function of a commodity is **10**

$S=ap^2+bp+c$ $(P,S)=(2,12),(3,38)$ and (4, 74). Find the constants a, b, c to determine exact supply function and find S when P = 5.

(b) Attempt any **two** :

(1) State the type of the following functions :

(a) $f : N \to N; f(x) = 7$

(b) $f : Z \to Z ; f(x) = x^2 + 6$

(c) $f_2 : R \to R \; ; \; f_2'(x) = x^2 + 2X - 1$.

(2) If $f(x) = 1/x \; ; x \in z - \{-1, 0, 1\}$ then prove that :

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

(3) If $f(x) = \log\left(\frac{1+x}{1-x}\right)$ then prove that $f(x) - 1/2\, f\left(\frac{2x}{1+x^2}\right)$.

(4) The production cost of each book is Rs : 30, and the fixed cost is Rs. 15,000. If the selling price is Rs. 45 then find (i) Cost function (ii) Revenue function (iii) Break even point.

4 (a) Without expansion prove that **5**

$$\begin{vmatrix} x & x & x \\ x & y & y \\ x & y & z \end{vmatrix} = x(y-z)(x-y)$$

OR

(a) Without expansion prove that

$$\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4\,abc$$

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

(1) Find inverse of $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & 5 & 6 \\ 1 & 1 & 2 \end{bmatrix}$.

(2) Solve using Creamer's rule,

$3x+5y+6z=4,\ x+2y+3z=2,\ 2x+4y+5z=3$

(3) If $A=\begin{bmatrix}1 & 2 & 1\\ 0 & 1 & -1\\ 3 & -1 & 1\end{bmatrix}$ then prove that ,

$A^3-3A^2-A+9I=0$ (null matrix of 3×3).

(4) If $A=\begin{bmatrix}3 & 1\\ 2 & 4\end{bmatrix} B=\begin{bmatrix}5 & 6 & 0\\ 0 & 1 & 2\end{bmatrix}$ then show that,

$(AB)^T=B^T A^T$.

5 (a) Prove the following : **5**

(i) $P\wedge(q\wedge r)=(p\wedge q)\wedge r$

(ii) $P\wedge(q\vee r)=(p\wedge q)\vee(p\wedge r)$.

OR

(a) Let $D_8=\{1,2,4,8\}$ Define +, • and ' on D_8 by $x+y=lan$ of x and y.

$x\cdot y=g.c.d.\ of$ x and y

$x'=8/x$

Verify that $(D_8,+,\bullet,',1,8)$ is not boolean algebra.

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

(1) $\forall x,y\in B$ where B is a Boolean algebra,

Prove that $(x\cdot y)'=x'+y'$ and $(x+y)'=x'\cdot y'$.

(2) In a Boolean algebra, prove that the compliment of any element is unique.

(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) Prove the following laws :

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

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