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CS-60

BACHELOR IN COMPUTER APPLICATIONS

Term-End Examination

00637

June, 2012

CS-60 : FOUNDATION COURSE IN MATHEMATICS IN COMPUTING

Time : 3 hours *Maximum Marks : 75*

Note : *Question **No. 1** is **compulsory**. Attempt **any three** questions from question **No. 2 to 6**. Use of calculator is **permitted**.*

1. (a) If f is a real function defined by $f(x) = \frac{x-1}{x+1}$

then prove that $f(2x) = \frac{3f(x)+1}{f(x)+3}$. **15x3=45**

(b) Find the inverse relation R^{-1} in each of the following cases :

(i) $R = \{(1, 2), (1, 3), (2, 3), (3, 2), (5, 6)\}$

(ii) $R = \{x, y) : x, y \in N, x + 2y = 8\}$

(iii) R is a relation from {11, 12, 13} to {8, 10, 12} defined by $y = x - 3$.

(c) Show that the function $f : \mathbf{R} \to \mathbf{R}$ defined as $f(x) = 5x + 4 \; \forall \; x \in R$ is one - one and onto.

(d) Find $\frac{dy}{dx}$ if $xy+y^2+3x^2y^3+4x^3+5=0$

(e) Evaluate $\int_3^5 (9x^2 + 4x + 5)\,dx$.

(f) Show that the four points $(0, -1)$, $(6, 7)$. $(-2, 3)$ and $(8, 3)$ are the vertices of a rectangle.

(g) Find the slope of a line which passes through the points $(3, 2)$ and $(-1, 5)$.

(h) Find the centre and radius of the given circle $x^2+y^2-4x+6y=12$.

(i) Find the equation of the parabola whose focus is $(-3, 2)$ and the directrix is $x+y=4$.

(j) Find the equation of the ellipse whose eccentricity is $\frac{1}{2}$, the focus is $(-1, 1)$ and the directrix is $x-y+3=0$.

(k) Find the equation of the hyperbola whose directrix is $2x+y=1$, focus is $(1, 2)$ and eccentricity is $\sqrt{3}$.

(*l*) Let $V=\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A=\{1, 2, 3, 4\}$ $B=\{2, 4, 6, 8\}$, $C=\{3, 4, 5, 6\}$ find (i) $(A\cap C)'$ (ii) $(A\cup B)'$ (iii) $(B-C)'$

(m) Solve the simultaneous equations $x-y=5$; $3x+7y=5$.

(n) Find the real numbers x and y if $(x-iy)$ $(3+5i)$ is the conjugate of $-6-24i$.

(o) Evaluate $\int x^3 \sin(x^4+1)\,dx$

2. (a) Find the equation of the plane through the points $(2, 1, -1)$ and $(-1, 3, 4)$ and perpendicular to the plane $x-2y+4z=10$.

(b) Find the path traced by the centre of a sphere which touches the lines $y=x$, $z=1$ and $y=-x$, $z=-1$.

(c) Find the equation of the cylinder having for its base the circle $x^2+y^2+z^2=9$; $x-y+z=3$. **3+4+3**

3. (a) If α and β are the roots of the equation $2x^2-6x+2=0$. Form the equation whose roots are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$. **3+3+4**

(b) Prove that $(A-B)\cup B = A\cup B$.

(c) Express the given complex number in the polar form $\frac{2+6\sqrt{3}\,i}{5+\sqrt{3}\,i}$.

4. (a) Evaluate : $\int (4x+5)^6\, dx$. **3+3+4**

(b) Evaluate : $\int (\log x)^2\, dx$.

(c) If $y=\left[x+\sqrt{x^2+a^2}\right]^n$. Prove that

$$\frac{dy}{dx}=\frac{ny}{\sqrt{x^2+a^2}}.$$

5. (a) Find the equation of the circle through the points of intersection of the circles $x^2+y^2+2x+3y-7=0$ and $x^2+y^2+3x-2y-1=0$ and passes through the point (1, 2). **4+3+3**

(b) Obtain the equation of the parabola whose vertex is at (a, 0) and focus is at (b, 0) ($b \neq 0$).

(c) Find the co - ordinates of the centre, foci and length of the latus rectum and equations of the directrices of the ellipse

$$\frac{(x-2)^2}{25}+\frac{(y+3)^2}{16}=1.$$

6. (a) Determine the local maximum and local minimum of the function $x^3-7x^2+8x+32$.

(b) Find the point on the curve $y=2x^2-6x-4$ at which the tangent is parallel to the x - axis. **3+4+3**

(c) Find the equation of the normal to the curve $y=2x^2+3 \sin x$ at $x=0$.