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SARDAR PATEL UNIVERSITY
B.Sc. (I Semester) Examination
2016
11th April 2016 (Monday)
2.30 pm - 4.30 pm

US01CMTH01 – Mathematics / Analytic Geometry and Complex Numbers

Total Marks: 70

Q.1 Answer the following by selecting the correct answer from the given options. **(10)**

1) Asymptote of y= x^3-3x^2+2x are _____.
   (a) x =0,1,2; y=1 (b) x=0,-1,2; y=0 (c) x =0,1,-2 (d) Not possible
2) If $(\frac{dy}{dx})_p$=0 then the tangent at point p is parallel to the_____.
   (a) y-axis (b) x-axis (c) Line x =5 (d) None of these
3) The shape of Lemniscates looks like_____.
   (a) 8 (b) Flower (c) Rose (d) Heart Shape
4) The curve of r=5sin 7θ has_____ loops.
   (a) 5 (b) 7 (c) 14 (d) 12
5) The curve r= aθ is symmetric about_____.
   (a) Polar axis (b) Normal axis (c) pole (d) None of these
6) Polar equation of vertical line through the point (3, 180^0) is_____.
   (a) 3= rcos θ (b) 3= rsin θ (c) 3=- rsin θ (d) 3= -rcos θ
7) The equation of curve 3=r(cos θ -2sin θ) represent _____.
   (a) Circle (b) Line (c) Hyperbola (d) Parabola
8) If eccentricity e >1 then conic is _____.
   (a) Hyperbola (b) Parabola (c) Circle (d) ellipse
9) The imaginary part of z= (1+2i)(1-3i) is_____.
   (a) 1 (b) -1 (c) 7 (d) -7
10) $(cis\theta)^{3/7}$ has only _____ distinct values.
   (a) 3 (b) 7 (c) $\frac{3}{7}$ (d) $\frac{1}{7}$

Q.2 Answer ANY TEN of the following. **(20)**

1) Discuss symmetries of the curve $xy - 16 = 0$.
2) Find the parametric equation of $x^{2/3}+y^{2/3}= a^{2/3}$.
3) Find the tangent parallel to axes for $x = cos^2\theta$; y =2sinθ.
4) Identify the curve 3(1- cos θ).
5) Transfer the equation r=tan θ +sec θ in to Cartesian form.
6) Express the point $(\sqrt{3}, 1)$ in polar form.

7) Find radius and center of the circle r= $3\sin\theta$.
8) Find the equation of the horizontal line through the point (-2, 90°).
9) Find the polar equation of circle with center at (4, 90°) and passes through pole.
10) Find modulus of z= $\frac{(3-\sqrt{2i})^2}{1+2i}$.
11) Find amplitude of z = $-\sqrt{3}+i$.
12) Find z+ $\frac{1}{z}$ for z=4+5i.

Q.3

a) If a curve given by $x = f(t)$, y = g(t) and both x and y get numerically large as t approaches some number say "a". Then an oblique asymptote to the curve if it exit is given by y=mx+c; **(05)**

Where, m=$\lim_{t\to a}(\frac{dy}{dx})$ and c=$\lim_{t\to a}(y - mx)$.

b) Sketch the curve given by y = $\frac{x(x-4)}{(x-1)(x+2)}$ **(05)**

OR

Q.3

a) Obtain parametric equations of cycloid. **(05)**

b) Find the equations of tangent and normal line to a curve $y^2 = 4ax$ at point (at^2, 2at). **(05)**

Q.4

a) State when the polar curve is symmetric with respect to polar axis? Also prove it. **(05)**

b) Discuss symmetry, extent, closeness of the curve r^2=9sin2θ and hence sketch the curve. **(05)**

OR

Q.4

a) State when the polar curve is symmetric with respect to normal axis? Also prove it. **(05)**

b) Sketch the curve given by r=3(1+cosθ) **(05)**

Q.5

a) In usual notations prove that $r = \frac{pe}{1+e\cos\theta}$. **(05)**

b) If any straight line through the pole meets the circle $r^2 - 2rd\cos(\theta - \alpha) + d^2 - a^2 = 0$ at point P and Q. Then prove that $OP.OQ = d^2 - a^2$. **(05)**

OR

Q.5

a) Prove that equation of line not passing through the pole is $p = r\cos(\theta - \omega)$, where (p, ω) is the foot of perpendicular from the pole. **(05)**

b) Identify curve $r = 1+\cos\theta$. Also find its reciprocal curve. Sketch both of the curves with the same frame of reference. **(05)**

Q.6

State and prove De-Moiver's Theorem. **(10)**

OR

Q.6

Expand $\cos^8\theta$ in a series of cosines of multiples of θ. **(10)**

X=X=X