SUBJECT CODE NO:- P-1
FACULTY OF ENGINEERING AND TECHNOLOGY
F. E. Examination MAY/JUNE-2016
Engineering Mathematics-I
(Revised)

[Time: Three Hours] **[Max Marks:80]**

"Please check whether you have got the right question paper."

N.B
i) Q.No.1 and Q.No.6 are compulsory.
ii) Solve any two questions from Question No. 2, 3, 4 and 5.
iii) Solve any two questions from Question No. 7, 8, 9 and 10.
iv) Figure to the right indicates full mark.
v) Assume suitable data, if necessary.

Section A

Q.1 Solve any five of the following. (Each question carry equal marks) 10

A. Find the amplitude of $1+\sqrt{3}\;i$.
B. Find the general value of $\log i$.
C. Find the n[th] derivative of $\sin 3x\ \cos 4x$.
D. Evaluate $\lim_{x\to 0}\frac{1-\cos x}{x^2}$.
E. Obtain the expansion of $\sin x$.
F. State Ratio test.
G. Find the solution of exact differential equation
$(y\cos x+\sin y+y)dx+(\sin x+x\cos y+x)dy=0$
H. Find integrating factor of $x^2\frac{dy}{dx}=3x^2-2xy+1$.

Q.2

A. Separate $i^{(1+i)}$ into real and imaginary parts. 05
B. Find n[th] derivative of $e^{3x}\cos 2x\cos 4x$. 05
C. Solve 05
$\left(\frac{2xy+1}{y}\right)dx+\left(\frac{y-x}{y^2}\right)dy=0$

Q.3

A. Solve the equation $x^5-1=0$ using complex number. 05
B. Prove that $\log x=(x-1)-\frac{1}{2}(x-1)^2+\frac{1}{3}(x-1)^3+\cdots$.. 05
C. Solve 05
$(1+x^2)\frac{dy}{dx}+y=e^{\tan^{-1}x}$

Q.4

A. Find the expansion of $\sin 7\theta$. 05
B. Prove that $\lim_{x\to\frac{1}{2}}\ \frac{cos^2\pi x}{e^{2x}-2xe}=\frac{\pi^2}{2e}$. 05
C. A coil having resistance of 15 ohms and an inductance of 10 Henries is connected to 90 volts supply. Determine the value of the current after two seconds. 05

Q.5 A. If $\sin(\alpha + i\beta) = x + iy$ then prove that $\frac{x^2}{\cos h^2\beta} + \frac{y^2}{\sin h^2\beta} = 1.$ 05

B. Find the orthogonal trajectory of the curve $r = a(1 + \cos\theta)$. 05

C. Discuss the convergence of the series $\sum_{n=1}^{\infty} \frac{n^2}{3^n}$ 05

Section B

Q.6 Solve any five of the following. 10

A. Find the asymptotes of $y^2(a - x) = x^3$.

B. The curve $r = 3 + 2\cos\theta$ is symmetric about ____________.

C. The length of curve $x = f(t), y = g(t)$ from $t = A$ and $t = B$ is given by __________.

D. If $z = xy^2 + x^2y$, where $x = at^2, y = 2at$ find $\frac{dz}{dt}$

E. Find x $\frac{\partial u}{x} + y\frac{\partial u}{\partial y}$; if $u = e^{\frac{x}{y}} cos\left(\frac{x}{y}\right)$.

F. If u $= x\sin y$, $v = y\sin x$ then find $\frac{\partial(u,v)}{\partial(x,y)}$.

G. Find stationary points of the function $x^2 + y^2 + 6x + 12$.

H. $f(x, y)$ has maximum value at (a,b) if _____________.

Q.7 A. Trace the curve $x^2(x^2 + y^2) = a^2(x^2 - y^2)$ with full justification. 05

B. If $u = y^x$ then prove that $\frac{\partial^2 y}{\partial x \partial y} = \frac{\partial^2 u}{\partial y \partial x}$ 05

C. Find $\frac{\partial(x,y,z)}{\partial(u,v,w)}$, where $x = \frac{vw}{u}$, $y = \frac{uw}{v}$, $z = \frac{uv}{w}$ 05

Q.8 A. Trace the curve $r = a(1 + \cos\theta)$ with full justification. 05

B. If $u = \sin^{-1}\left[\frac{x+y}{\sqrt{x}+\sqrt{y}}\right]$ then prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = \frac{1}{2}\tan u$. 05

C. Find the length of curve $\theta = \frac{1}{2}\left[r + \frac{1}{r}\right]$.for r=1 to r=3 05

Q.9 A. Trace the curve $x^{2/3} + y^{2/3} = a^{2/3}$ full justification. 05

B. If $u = f(x - y, y - z, x + z)$ then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0.$ 05

C. Find the stationary value of $x^3 + y^3 - 3axy = 0$. 05

Q.10 A. Find the length of the arc of the curve $ay^2 = x^3$ from the vertex to the point whose absicca is b. 05

B. Using Lagrange's method of undetermined multipliers find the largest product of numbers xyz when $x^2 + y^2 + z^2 = 9$. 05

C. Find the length of the curve $= a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$ between $\theta = 0$ to $\theta = 2\pi$. 05

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