Q 8229

M.E. DEGREE EXAMINATION, MAY/JUNE 2006.

First Semester

Applied Electronics/Communication Systems/Optical Communication/ VLSI Design/Digital Communication and Network Engineering/Computer and Communication

MS 1616 — APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the radius of convergence and circle of convergence of the complex power series?

2. How will you find the residue if $f(z)$ has multiple poles of order m at $z = a$.

3. Find the stationary values of
$f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.

4. Write two properties of Jacobians.

5. How will you solve an exact differential equation $M(x, y)dx + N(x, y)dy = 0$.

6. If $J_n(x)$ is a Bessel's function then what are the values of $J_0(0)$ and $J_1(0)$?

7. Evaluate $\int_c (x^2\,dy + y^2 dx)$ where C is the path $y = x$ from $(0, 0)$ to $(1,1)$.

8. Using Green's theorem in a plane evaluate $\int_c (2x - y)dx + (x + y)dy$ where c is the boundary of the circle $x^2 + y^2 = a^2$ in XOY plane.

9. Bring out the fallacy, if any, in the following statement : The mean of a binomial distribution is 5 and its standard deviation is 3.

10. Write the test statistic in χ^2 test.

PART B — (5 × 16 = 80 marks)

11. (i) The number of accidents in a years to taxi - drivers in a city follows a Poisson distribution with mean equal to 3. Out of 1000 taxi drivers, find approximately the number of drivers with no accidents in a year and more than 3 accidents in a year. (8)

(ii) Obtain the two regression equations from the following data : (8)

x :	12	18	7	8	9	6
y :	90	40	50	15	10	35

12. (a) (i) Expand $\frac{(x+h)(y+k)}{x+h+y+k}$ in a series of powers of h & k upto 2nd degree terms. (8)

(ii) Find the Laurent's expansion of the function

$$f(z)=\frac{7z-2}{(z+1)z(z-2)} \text{ in } 1<|z+1|<3 \quad (8)$$

Or

(b) (i) Evaluate $\int_0^{2\pi} \frac{d\theta}{1-2a\sin\theta+a^2}$ $0<a<1$. (8)

(ii) Evaluate $\int_c \frac{z-3}{z^2+2z+5}dz$ where c is $|z+1-i|=2$. (8)

13. (a) (i) Solve the differential equation

$$(xy^3+y)dx+2(x^2y^2+x+y^4)dy=0. \quad (8)$$

(ii) Solve $x^2\frac{d^2y}{dx^2}+x\frac{dy}{dx}+y=\log x\,.\sin(\log x)$ (8)

Or

(b) (i) Solve in series the equation $\frac{d^2y}{dx^2}+x^2y=0$ (8)

(ii) Prove that $\frac{d}{dx}\left[x^nJ_n(x)\right]=x^nJ_{n-1}(x)$. (8)

14. (a) (i) If $u = xyz$, $v = xy + yz + zx$, $w = x + y + z$ show that $\frac{\partial(u, v, w)}{\partial(x, y, z)} = (x - y)(y - z)(z - x)$. (8)

(ii) Find the volume of the largest rectangular parallelopiped that can be inscribed in the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ (8)

Or

(b) (i) Evaluate $\int_0^\infty \frac{\tan^{-1} ax}{x(1 + x^2)} dx$ by applying differentiation under the integral sign. (8)

(ii) Express $\iint xy\, dxdy$ in terms of u, v given $x = u(1 - v)$, $y = uv$ (8)

15. (a) (i) Write the physical interpretation of divergence. (8)

(ii) Use Green's theorem in a plane to evaluate $\int_c [(2x^2 - y^2)dx + (x^2 + y^2)dy]$ where c is the boundary in xy – plane enclosed by x - axis and semi circle $x^2 + y^2 = 1$ in upper half xy plane. (8)

Or

(b) Verify Stoke's theorem for $\overline{F} = (2x - y)\bar{i} - yz^2\ \bar{j} - y^2\ z\ \bar{k}$ over upper half of $x^2 + y^2 + z^2 = 1$ bounded by its projection on xy plane. (16)
