B.E. Electrical (Electronics & Power) Engineering / Electronics & Telecommunication / Comm. Engineering / Electronics Engineering / Instrumentation Engineering / Mechanical Engineering
Fourth Semester

# EP 401/ET 401/EN 401/IN401/ME401 - Electrical Engineering Mathematics / Applied Mathematics-IV / Mathematics-IV

P. Pages : 3 **GUG/W/18/1549**

Time : Three Hours * 1 2 1 8 * Max. Marks : 80

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Notes : 1. All questions carry equal marks.
2. Use of non programmable calculator is permitted.

**1.** a) Find the Z-transform of $\cos n\alpha$. Hence find $z\{a^n \cos n\alpha\}$. **8**

b) If $z\{f(n)\} = F(z)$ prove that $z\left\{\frac{f(n)}{n+k}\right\} = z^K \int_z^\infty \frac{F(z)}{z^{K+1}} dz$ **8**

Hence find $z\left\{\frac{1}{n+1}\right\}$.

**OR**

**2.** a) Find $z^{-1}\left\{\frac{z^2}{(z-a)^2}\right\}$ by using convolution theorem. **8**

b) Use z-transform to solve $y_{n+2} + 5y_{n+1} + 6y_n = 6^n$ given that $y_0 = 0, y_1 = 1$. **8**

**3.** a) If $u = \frac{1}{2}\log(x^2 + y^2)$ then find analytic function $F(z) = u + iv$ in terms of Z. **8**

b) Evaluate $\oint_C \frac{\tan z/2}{\left(z - \frac{\pi}{2}\right)^2} dz$ where C is a square with vertices at $\pm 2i, 2 \pm 2i$ by using Cauchy's integral formula. **8**

**OR**

**4.** a) Expand $F(z) = \frac{1}{(1-z)(2-z)}$ in a Laurent's series valid for the range. **8**

i) $1 < |z| < 2$ ii) $|z-1| > 1$

b) Evaluate $\int_0^{2\pi} \frac{1}{5 + 4\cos\theta} d\theta$ by using contour integration. **8**

**5.** a) Find the real root of equation $xe^x = \cos x$ correct to four places of decimals by false position method. **8**

b) Solve **8**
$x+7y-3z+22=0,\ 2x-y+6z-22=0,\ 5x-2y+3z-18=0$ by using Gauss Seidal method.

**OR**

**6.** a) Find the real root of the equation $x\log_{10}x=2$ correct to four places of decimals by using Newton – Raphson method. **8**

b) Solve : **8**
$5x+2y+z=-12,\ -x+4y+2z=20\ 2x-3y+10z=3$ By using Crout's Method.

**7.** a) Use Taylor's series to find $y(0.1)\&y(0.2)$ if $\frac{dy}{dx}=2y+3e^x$ and $y(0)=0$. **8**

b) Using Milne's predictor – corrector method find $y(0.8)\&y(1)$ from $\frac{dy}{dx}=\frac{1}{x+y}$ **8**
given that $y(0)=2, y(0.2)=2.0933, y(0.4)=2.1755 y,\ (0.6)=2.2493$.

**OR**

**8.** a) If $\frac{dy}{dx}=\frac{y^2-x^2}{y^2+x^2}$ & $y(0)=1$. Find $y(0.4)$ by using Runge – Kutta Fourth order method. taking $h=0.2$. **8**

b) Solve $\frac{dy}{dx}=x+\left|\sqrt{y}\right|$ given that $y=1$ when $x=0$ for the range $0\le x\le 0.4$ in step of 0.2 by using modified Euler's method. **8**

**9.** a) A random variable X has following probability distribution. **8**

| X : | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| f(x) : | a | 3a | 5a | 7a | 9a | 11a | 13a | 15a | 17a |

Find (i) constant a (ii) $P(X\le 3)$ (iii) $P(X>6)$ (iv) Distribution function of X.

b) The Joint density function of two continuous random variable x & y is **8**

$$F(x,y)=\begin{cases}cxy, & 0<x<4,\ 1<y<5\\ 0, & \text{otherwise}\end{cases}$$

Find :
1) Constant C
2) $P(1<x<2,\ 2<y<3)$
3) $P(x\ge 3,\ y\le 2)$
4) The marginal distribution functions of x & y.

**OR**

**10.** a) **8**

Let $X = \begin{cases} 1, \text{ probability } \frac{1}{6} \\ 2, \text{ probability } \frac{1}{3} \\ 3, \text{ probability } \frac{1}{2} \end{cases}$

Find :

i) Mean

ii) Variance

iii) The moment generating function.

b) The density function of random variable X is **8**

$$F(x) = \begin{cases} \frac{4x(9-x^2)}{81}, & 0 \le x < 3 \\ 0 \quad , & \text{otherwise} \end{cases}$$

Find the coefficient of (i) Skewness (ii) Kurtosis.

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