Register Number: ……………………..

**B.E/B.TECH DEGREE EXAMINATIONS: APRIL/MAY 2014**

(Regulations 2009)

Third Semester

**MAT104: ENGINEERING MATHEMATICS - III**

(Common to AERO, AUTO,CE,ECE,EIE,EEE,ME & MCT)

**Time: Three Hours** **Maximum Marks: 100**

**Answer all the Questions:-**

**PART A (10 x 1 = 10 Marks)**

1. The order of the PDE $u_{xx}+4u_{xy}+14u_{yy}=0$
   a) 4 b) 2
   c) 3 d) 1
2. The complete integral of $z = px+qy-pq$ is
   a) $z=x+y+f(x,y)$ b) $z=xy$
   c) $z=x^2+y^2$ d) $z = ax+by-ab$
3. The value of $b_n$ for $f(x)=|x|$ in (-1,1) is
   a) 0 b) 1
   c) 2 d) X
4. The value of $a_o$ , $a_n$ for $f(x)=\tan x$ in $(-\pi,\pi)$ is
   a) 0,0 b) 1,1
   c) 1,2 d) 2,2
5. The two dimensional heat flow equation in steady state is
   a) $u_x=u_{tt}$ b) $u_t=u_{xx}$
   c) $u_{xx}+u_{YY}=0$ d) $u_x+u_y=0$
6. The solution of the one-dimensional wave equation is
   a) steady b) unsteady
   c) periodic d) none
7. The Fourier transform is
   a) self-reciprocal b) pair
   c) unity d) none
8. If $F(f(x))=F(S)$ then $F(f(x-a))=------$
   a) $e^{-as}$ b) $e^{ias}F(s)$
   c) $e^{-ias}F(s)$ d) $F(s)a$
9. The Z transform of 1 is
   a) $\frac{z}{(z+1)}$ b) z
   c) $\frac{z}{(z-1)}$ d) $\frac{z^2}{(z+1)}$
10. If $Z(f(n))=F(z)$, then $Z(2f(n))$ is
   a) $2F(z)$ b) $\frac{F(z)}{2}$
   c) $4F(z)$ d) none

**PART B (10 x 2 = 20 Marks)**

11. Form the PDE from $z=ax^n+by^n$
12. Find the complete integral of $\sqrt{p}+\sqrt{q}=1$
13. State the convergence condition on Fourier series.
14. Find the value of $a_o$ , $a_n$ for the function $f(x)=\sinh x$ defined in $(-\pi,\pi)$
15. Write the steady state solution of the one dimensional heat equation.
16. State the physical meaning of the constant term in the one dimensional wave equation.
17. Find the Fourier transform of $e^{-|x|}$
18. Find the Fourier sine transform of $e^{-bx}$
19. Find the Z transform of $3^n$
20. State the initial value theorem on Z transform.

**PART C (5 x 14 = 70 Marks)**

21. a) (i) Solve $x^2p^2+y^2q^2=z^2$ (6)
   (ii) Solve $(D^2+DD'-6D'^2)z=e^{x-y}+\cos(2x+y)$ (8)

**(OR)**

   b) (i) Solve $(D^3-7DD'^2-6D'^3)z=\cos(x+2y)+x$ (8)
   (ii) Solve $x(y-z)p+y(z-x)q=z(x-y)$ (6)

22. a) (i) Obtain the Fourier series expansion of $x+x^2$ in the interval $(-\pi,\pi)$ (7)
   (ii) Find the cosine series for $f(x)=e^x$ in (0,1). (7)

**(OR)**

b) Obtain the Fourier series for y=f(x) up to second harmonic for the following data:

| x | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| f(x) | 9 | 18 | 24 | 28 | 26 | 20 |

23. a) A taut string of length $2l$ is fastened at both ends. The midpoint of the string is displaced by a distance $b$ transversely and the string is released from rest in this position. Find the displacement of any point of the string at any subsequent time.

**(OR)**

b) A bar of $10cm$ long, with insulated sides, has its ends $A$ and $B$ kept at $50°C$ and $100°C$ respectively until steady state conditions prevail. The temperature at $A$ is then suddenly raised to $100°C$ and at the same instant that at $B$ is lowered to $60°C$. Find the subsequent temperature at any time of the bar at any time.

24. a) Find the Fourier transform of $f(x)=\begin{cases} a^2-x^2\,; |x|<a \\ 0 \quad ; |x|>a>0 \end{cases}$.

Hence find (i) $\int_0^\infty \frac{\sin t - t\cos t}{t^3}$ and (ii) $\int_0^\infty \left(\frac{\sin - \cos t}{t^3}\right)^2 dt$

**(OR)**

b) (i) Find $F_c[e^{-a^2x^2}]$ and hence find $F_s[xe^{-a^2x^2}]$. (8)

(ii) Using Parsevel's identity evaluate $\int_0^\infty \frac{x^2dx}{\left(x^2+a^2\right)^2}$ (6)

25. a) (i) State and prove final value theorem on Z – Transform. (7)

(ii) Using convolution theorem find the inverse Z – transform of $\frac{z^2}{(z-a)(z-b)}$ (7)

**(OR)**

b) Using Z–transform solve:

$u_{n+2}-3u_{n+1}+2u_n=4^n \;given\; that\; u_0=0\, and\; u_1=1.$

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