Marks scored:

KATHMANDU UNIVERSITY
End Semester Examination [C]
July, 2017

JUL 09 2017

Level : B. E./B. Sc./B. Tech.	Course : MATH 207
Year : II	Semester : I/II
Exam Roll No. :	Time: 30 mins.	F. M. : 20
Registration No.:	Date :

SECTION "A"
[10Q. × 1 = 10 marks]

Fill in the blank(s) (question number 1 through 10) by the most appropriate word(s) or symbol(s):

1. A family of curves that intersect a given family of curves at right angles is called

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2. The function u (t-a) = 0 for t<a and 1 for t< 0 is called

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3. $L^{-1}\left(\frac{1}{s-a}\right) =$ - - - - - - - - - - -

4. Substituting $y^{-3}=u$ the differential equation $y' + \frac{1}{3}y = \frac{1}{3}(1-2x)y^4$ can be reduced into

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5. If a mapping w = f(z) preserves angles between oriented curves in magnitude as well as in sense is known as

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6. Formula for second shifting theorem $L\{f(t-a)u(t-a) =$ -------------------------

7. $L(f'''(t)) =$ --

8. Value of $f(z)=\bar{z}^2$ at $z=\frac{1}{2}+4i$ is --

9. Wronskian of cosx and sinx is $w =$ --

10. $\int_c \operatorname{Re} z\,dz$ from 0 to 1+i = --

SECTION "B"

[10Q × 1= 10 marks]

Fill in the blank spaces (Question number 11 through 20) by choosing the most appropriate answers from among the given ones. Do not tick the answers.

11. Maclarurin's series expansion of sinhz = --

(i) $1-\frac{z^2}{2!}+\frac{z^4}{4!}-\cdots$ (ii) $z+\frac{z^3}{3!}+\frac{z^5}{5!}+\cdots$

(iii) $-1-\frac{z^2}{2!}-\frac{z^4}{4!}-\cdots$ (iv) $z-\frac{z^3}{3!}+\frac{z^5}{5!}-\cdots$

12. $(x^3+3xy^2)\,dx+(x^3+3xy^2)\,dy=0$ is said to be exact if--

[$\frac{\partial N}{\partial y}=\frac{\partial M}{\partial x}$, $\frac{\partial M}{\partial y}=\frac{\partial N}{\partial x}$, $\frac{\partial M}{\partial y}=-\frac{\partial N}{\partial x}$, $\frac{\partial N}{\partial y}=-\frac{\partial M}{\partial x}$]

13. $\frac{1}{(z-3)(z-1)^2}$, $|z|=2$ has poles of order ----------------------------------at z =1

[3, 4, 2, 1]

14. Laplace transform is a --operation

[Linear, Quadratic, Cubic, Fractional]

15. The radius of convergence of the series $\sum_{n=1}^{\infty}\frac{3^n z^n}{n^{10}}=$ ---

[0, ∞ e^{3x}, $\frac{1}{3}$]

16. If f(z) is analytic in a simply connected domain D for any z_0 in D and closed path C in D containing z_0 in its interior then we have Cauchy's integral formula as $f(z_0)$ = ---

$\frac{1}{2\pi i}\oint_C \frac{f(z)}{z-z_0}dz$ $\frac{1}{2\pi i}\oint_C \frac{f(z_0)}{z-z_0}dz$ $\frac{1}{2\pi i}\oint_C \frac{z-z_0}{f(z)}dz$ $\frac{1}{2\pi i}\oint_C \frac{(z-z_0)}{f(z_0)}dz$

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17. Cauchy-Riemann equation for the function f(z) = u(x,y)+i v(x,y) is

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[$u_x=v_y, u_y=-v_x$, $-u_x=v_y, u_y=v_x$, $u_x=v_y, u_y=v_x$, $u_x=v_x, u_y=-v_y$]

18. If z = 1+i then $\arg(\frac{z}{\bar{z}})=$ --

[π, $\pi/2$, 0, $-\pi/2$]

19. If P(x,y) dx +Q(x,y) dy =0 is not exact then to make it exact the integrating factor F(x) =

$e^{\int \frac{1}{P}\left(\frac{\partial Q}{\partial x}-\frac{\partial P}{\partial y}\right)dy}$, $e^{\int \frac{1}{Q}\left(\frac{\partial P}{\partial y}-\frac{\partial Q}{\partial x}\right)dy}$,

$e^{\int \frac{1}{Q}\left(\frac{\partial P}{\partial y}-\frac{\partial Q}{\partial x}\right)dx}$, $e^{\int \frac{1}{PQ}\left(\frac{\partial P}{\partial x}-\frac{\partial P}{\partial y}\right)dy}$,

20. *if* $e^{2z}=2$ *then* $x=$ --

[$\ln\sqrt{2}$, 0, $\ln\sqrt{2}+2n\pi i$, $\ln 2$]

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End Semester Examination [C]
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Level : B. E./B. Sc./B. Tech.
Year : II
Time : 2 hrs. 30 mins.

Course : MATH 207
Semester : I/II
F. M. : 55

SECTION "C"
[3Q × 7 = 21 marks]

1. Define basis of the differential equation. If one basis of : [1+3+3]
$y''+p(x)y'+q(x)y=0$ is y_1 then derive other basis y_2. Also find the solution of
$xy''+2y'+xy=0$, $y_1=\frac{\cos x}{x}$

OR

State three solutions under which differential equation $y''+p(x)y'+q(x)y=0$ can be solved according to nature of roots of auxiliary equation. Using the same concept solve the differential equation $y''-2y'-3y=0$, $y(0)=2$, $y'(0)=14$ [3+4]

2. Find by the technique of solving non-homogeneous differential equation, the current in the RLC-circuit by using following data: [7]
$L=0.1H$, $R=20\Omega$, $C=2x10^{-4}F$, $E(t)=110\sin 415t$

3. Solve the following pde:
$u_{xx}-2u_{xy}+u_{yy}=0$ [1+3+3]

SECTION "D"
[6Q × 4 =24 marks]

4. Solve by using the Laplace transform, the differential equation : [4]
$y''+2y'-3y=\sin t$, $y(0)=0$, $y'(0)=0$

5. State the convolution theorem and by using the same theorem find
$L^{-1}\left(\frac{s^2}{(s^2+w^2)^2}\right)$ [1+3]

6. Evaluate by the method of residue $\oint_C \tan \pi z dz$ $C:|z|=1$ [4]

OR

Evaluate $\int_0^{2\pi}\frac{\cos\theta}{3+\sin\theta}d\theta$ around the unit circle [4]

7. Using Cauchy's integral formula evaluate $\oint_C \frac{z^3-6}{2z-i}dz$, $C:|z|=1$ [1+3]

8. If j_v and j_{-v} are Bessel's functions then show that they are linearly independent. [4]

9. Find the general solution of the following non-homogeneous differential equation:

$y^{(v)} - 3y^{(iv)} - 3y''' - y'' = 0$ [4]

SECTION "E"

[5Q × 2=10 marks]

10. Find linear fractional transformation that maps i ,1,-1 onto 1 ,0, ∞ in the respective order.

11. If $f(z)$ is analytic in a simply connected domain D, then prove that integral of $f(z)$ is independent of path in D.

12. Find center and radius of the series $\sum_{n=0}^{\infty} (n!)^2 i^n (z+1)^n \frac{1}{(2n)!}$

13. Find Laurent series expansion of $f(z) = \frac{1}{z}$ $at\ z = 2$ at $z_0=1$

14. Show that $\cos z = \cos x.\cosh y - i\sin x.\sinh y$ where z =x+iy