# University of Mumbai
# Examination 2020

Program: Civil Engineering
Curriculum Scheme: Rev2019
Examination: First/**Second**/Third/Final Year Semester I/II/**III**/IV/V/VI/VII/VIII
Course Code: and Course Name: Engineering Mathematics III

Time: 1 hour Max. Marks: 50

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For the students:- All the Questions are compulsory and carry equal marks .

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| Q1. | Find the Laplace transform of f(t), f(t)=a, 0< t <b and f(t)=0, t>b |
| Option A: | $\frac{ab}{s}(1-e^{-bt})$ |
| Option B: | $\frac{b}{s}(1-e^{-bt})$ |
| Option C: | $\frac{a}{s}(1-e^{-bt})$ |
| Option D: | $\frac{-a}{s}(1-e^{-bt})$ |
| | |
| Q2. | Find the Laplace transform of $4t^2+\sin 3t+e^{2t}$ |
| Option A: | $\frac{9}{s^3}+\frac{3}{s^2+3^2}+\frac{1}{s-2}$ |
| Option B: | $\frac{8}{s^3}+\frac{8}{s^2+3^2}+\frac{1}{s-2}$ |
| Option C: | $\frac{8}{s^3}+\frac{3}{s^2+3^2}+\frac{4}{s-2}$ |
| Option D: | $\frac{8}{s^3}+\frac{3}{s^2+3^2}+\frac{1}{s-2}$ |
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| Q3. | Construct an analytic function whose real part is $x^4-6x^2y^2+y^4$ |
| Option A: | $z^4+c$ |
| Option B: | $ez^4+c$ |
| Option C: | $e^4+c$ |
| Option D: | $x^4+c$ |
| | |
| Q4. | Find the Inverse Laplace transform $\frac{1}{s(s+a)}$ |
| Option A: | $\frac{1-e^{-at}}{ab}$ |
| Option B: | $\frac{1-e^{-at}}{a}$ |
| Option C: | $\frac{1-e^{-t}}{a}$ |
| Option D: | $\frac{1-e^{at}}{a}$ |
| | |
| Q5. | Find $L^{-1}[\frac{1}{S(S^2+4)}]$ |

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|---|---|
| Option A: | $\frac{1}{4}(1-cos2t)$ |
| Option B: | $\frac{1}{45}(1-sin2t)$ |
| Option C: | $\frac{1}{4}(1-Cot2t)$ |
| Option D: | $\frac{1}{4}(1-tan2t)$ |
| | |
| Q6. | The equations of the two lines of regression are $5x-y=22$ and $64x-45y=24$. Find $x$ and $y$. |
| Option A: | $x=6, y=8$ |
| Option B: | $x=3, y=8$ |
| Option C: | $x=4, y=8$ |
| Option D: | $x=6, y=5$ |
| | |
| Q7. | Given $N=5, \sum d_i^2=8$. Find the rank correlation coefficient R. |
| Option A: | $R=0.6$ |
| Option B: | $R=0.5$ |
| Option C: | $R=0.4$ |
| Option D: | $R=0.3$ |
| | |
| Q8. | Given $\sum d_x d_y=186, \sum d_x=11, \sum d_y=7, N=10, \sum d_x^2=215, \sum d_y^2=163$ Find the correlation coefficient r. |
| Option A: | 0.99 |
| Option B: | 0.88 |
| Option C: | 0.77 |
| Option D: | 0.55 |
| | |
| Q9. | Calculate the correlation coefficient for the following data<br>X: 3, 5, 4, 6, 2<br>Y: 3, 4, 5, 2, 6 |
| Option A: | 1 |
| Option B: | -.5 |
| Option C: | .7 |
| Option D: | .9 |
| | |
| Q10. | Construct an analytic function whose imaginary part is $\frac{y}{x}$ |
| Option A: | tan z +c |
| Option B: | sec z +c |
| Option C: | $e^x$ z +c |
| Option D: | log z +c |
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| Q11. | Find the value of an for xcosx in (- π , π ) |
| Option A: | 1/n |
| Option B: | 0 |
| Option C: | 2/n |

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| Option D: | 4 |
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| Q12. | In Fourier integral an is zero when function is |
| Option A: | Even |
| Option B: | Odd |
| Option C: | Real |
| Option D: | Neither even nor odd |
| | |
| Q13. | If f(x) is odd function then Fourier integral f(x) reduced to |
| Option A: | Cosine |
| Option B: | Sine |
| Option C: | Cosine and sine |
| Option D: | 0 |
| | |
| Q14. | What are periodic signals? |
| Option A: | The signals which change with time |
| Option B: | The signals which change with frequency |
| Option C: | The signal that repeats itself in time |
| Option D: | The signals that repeat itself over a fixed frequency |
| | |
| Q15. | Find the Laplace transform of sin5t |
| Option A: | $\frac{5}{s^2+5^2}$ |
| Option B: | $\frac{s}{s^2+5^2}$ |
| Option C: | $\frac{5}{s^2-5^2}$ |
| Option D: | $\frac{s}{s^2-5^2}$ |
| | |
| Q16. | Poles of $f(z)=\frac{1}{(z-1)(z+2)}$ |
| Option A: | 1,-2 |
| Option B: | -1,-2 |
| Option C: | -1,2 |
| Option D: | 1,2 |
| | |
| Q17. | Poles of $f(z)=\frac{z}{(z+3)^2(z+2)}$ |
| Option A: | -3 of order 2 and -2 of order 1 |
| Option B: | -3 of order 2 and -2 of order 2 |
| Option C: | 3 of order 2 and -2 of order 1 |
| Option D: | -3 of order 1 and -2 of order 2 |
| | |
| Q18. | Find residue at z=1 for $f(z)=\frac{z}{(z+2)^2(z-1)}$ |
| Option A: | 1/9 |
| Option B: | -1/9 |
| Option C: | 2/9 |
| Option D: | -2/9 |

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| Q19. | The partial differential equation $xy\frac{\partial z}{\partial x} = \frac{\partial^2 z}{\partial y^2}$ |
| Option A: | Elliptic |
| Option B: | Hyperbolic |
| Option C: | Parabolic |
| Option D: | Not defined |
| | |
| Q20. | The partial differential equation$5\frac{\partial^2 z}{\partial y^2} + 6\ \frac{\partial^2 z}{\partial y^2} = xy$ |
| Option A: | Elliptic |
| Option B: | Hyperbolic |
| Option C: | Parabolic |
| Option D: | Not defined |
| | |

| **Q2** **(20 Marks)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | Find the Laplace transform of $\frac{1}{t}e^{-t}sint$ |
| B | Find the inverse Laplace transform of $\frac{1}{\sqrt{2s+1}}$ |
| C | Show that the function, $f(z) = sinhz$ is analytic and find $f'(z)$ in terms of z. |
| D | Find the Fourier series for f (x)=x in (0,2$\pi$). |
| E | Using Bender- Schmidt method, solve $\frac{\partial^2 u}{\partial x^2} - \frac{\partial u}{\partial t} = 0$, -subject to the conditions, u(0,t) = 0 , u(4,t) = 0, $u(x,0) = x^2(16 - x^2)$ taking h =1, for 3 minutes |
| F | Find Eigen value and Eigen vector of matrix$[4\ 6\ 6\ 1\ 3\ 2\ -1\ -5\ -2]$ |

| **Q3** **(20 Marks)** | **Solve any Four out of Six** **5 marks each** |
|---|---|
| A | Find the Laplace transform of $cost\ cos2t\ cos3t$ |
| B | Find the inverse Laplace transform of$\frac{s+2}{s^2(s+3)}$ |
| C | Determine whether the function $f(z) = x^2 - y^2 + 2ixy$ is analytic and if so Find its derivative. |
| D | Find the Fourier series for $f(x) = e^{-\lvert x \rvert}$ in (-π,π). |
| E | Find Eigen value and Eigen vector of matrix$[2\ -1\ 1\ 1\ 2\ -1\ 1\ -1\ 2]$ |
| F | Solve by Crank Nicholson simplified formula $\frac{\partial^2 u}{\partial x^2} - 16\frac{\partial u}{\partial t} = 0$, u(0,t) = 0, u(1,t) – 200t, u(x,0) = 0 taking h = 0.25 for one time step. |