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RAN-0843

SYBSc (Computer Science) Examination

March / April - 2019

Mathematics Paper: MCS-303

Differential Equations - I

Time: 2 Hours] **[Total Marks: 50**

સૂચના : / Instructions

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:

☛ **SYBSc (Computer Science)**

Name of the Subject :

☛ **Mathematics Paper: I MCS-303**

Subject Code No.: **0** **8** **4** **3**

Seat No.:

Student's Signature

Instructions :

1. All questions are compulsory.
2. Figures to the right indicate marks of corresponding questions.
3. Follow usual notations.
4. Use of non-programmable scientific calculator is allowed.

Q-1 **Answer the following questions as directed.** **10**

1. Solve $\frac{d^4y}{dx^4} - 13\frac{d^2y}{dx^2} + 36y = 0.$
2. Convert $x^2\frac{d^3y}{dx^3} + 2x\frac{d^2y}{dx^2} + 2\frac{y}{x} = 10\left(1 + \frac{1}{x^2}\right)$ into linear differential equation with constant coefficients.
3. Find $L^{-1}\{f(P)\}$ where $f(p) = \frac{3p+1}{p\left(p+\frac{1}{2}\right)}$

4. Find $L\{e^{-4t}\cosh 2t\}$

5. Find the inverse Laplace transform of $\frac{6}{2p-3}$

Q-2 Attempt any TWO. **10**

1. Describe the method of obtaining particular integral of $f(D)y = X$ where $X = e^{ax}$
2. Obtain the general solution of differential equation $(D^3 + 3D^2 + 2D)\ y = x^2$
3. Obtain the general solution of differential equation $(D^2 - 1)\ y = x^2 \cos x$
4. Obtain the general solution of differential equation $(D^4 + 2D^3 - 3D^2)\ y = x^2 + 3e^{2x} + 4\sin x$

Q-3 Attempt any TWO **10**

1. Solve: $x^2\frac{d^2y}{dx^2} + 2x\frac{dy}{dx} - 20y = (x+1)^2$
2. Solve: $x^3\frac{d^3y}{dx^3} + x\frac{dy}{dx} - y = 4x^3$
3. Solve: $x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + 4y = x^{-2}$
4. Solve: $x^2\frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 4x^2\log x$

Q-4 Attempt any TWO **10**

1. State and prove first shifting theorem for Laplace transform.
2. Prove that $L\{\alpha F_1(t) + \beta F_2(t)\} = \alpha L\{F_1(t)\} + \beta L\{F_2(t)\}$
3. Evaluate $\int_0^\infty \frac{e^{-2t} - e^{-t}}{t} = dt$
4. Prove that $L\{t\cosh 2t\} = \frac{p^2+4}{(P^2-4)^2}$

Q-5 Attempt any TWO. **10**

1. State and prove second shifting theorem for Inverse Laplace transformation.

2. Solve: $L^{-1}\left\{\frac{1}{(p+1)(p-2)}\right\}$

3. Solve: $L^{-1}\left\{\frac{p+2}{p^2-2p+5}\right\}$

4. Solve: $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + y = 1$ where $y(0)=1, y(0)=2$ are initial conditions.