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SIIIS-N 196 B-15

B.Sc./B.A. IIIrd Semester Degree Examination

Mathematics

(Riemann Integration and Ordinary Differential Equations)

Paper - 3.2

(New)

Time : 3 Hours Maximum Marks : 60

Instructions to Candidates :

Answer **all** the sections.

Section - A

I. Answer any **ten** of the following. **(10×2=20)**

1) Find $L(P,f), if\ f(x)=x$ and the partition $P=\left\{0,\frac{1}{3},\frac{2}{3},1\right\}$ in the interval [0,1].

2) If $f,g\in R[a,b]$, then prove that $f.g\in R[a,b]$.

3) State Weierstrass mean value theorem and Bonnets mean value theorem.

4) Solve $P^2 - 7P + 12 = 0$

5) Solve $x = y + a\log P$.

6) Find the general and Singular solution of $y = Px + P^2$

7) Solve $\frac{d^2y}{dx^2}-7\frac{dy}{dx}+12y=0$

8) Solve $\left(D^2+2D+1\right)y=2e^{2x}$

9) Solve $(2x+5)^2\frac{d^2y}{dx^2}-(2x+y)\frac{dy}{dx}+8=0$

10) If $\frac{dx}{dt} = x - y \, and \, \frac{dy}{dt} = x + y$. Find the solution if 'y'

11) Show that $x^2 \frac{d^2y}{dx^2} + 3\frac{dy}{dx} + y = 0$ is exact.

12) Find W (wronskian) If $y_2 + 9y = \sec 3x$

Section - B

II. Answer any **three** of the following questions **(3×5=15)**

1) Let $f(x) = \sin x \, for \, x \in [0, \pi] \, and$ Let $P = \left\{0, \pi/3, 2\pi/3, \pi\right\}$. Then find L (p,f) and U (p,f)

2) If f is defined on [0,1] by $f(x) = x^2 \, \forall x \in [0,1]$ then show that $f \in R[0,1]$ and $\int_0^1 f(x) dx = \frac{1}{3}$

3) If $f, g \in R[a, b]$ and hence there exist $t > 0$ such that $|g(x)| \geq t, \forall x \in [a,b] \, then \, f/g \in R[a,b]$

4) Show that $f : [a,b] \rightarrow R$ is monotonic on [a,b] then 'f' is integrable on [a,b].

5) Using first mean value theorem show that $\frac{2\pi}{13} < \int_0^{2\pi} \frac{dx}{10 + 3\cos x} < \frac{2\pi}{7}$

Section - C

III. Answer any **five** of the following. **(5×5=25)**

1) Solve $y = x + 2\tan^{-1} p$.

2) Find the general solution and singular solution of the function $y - 2pxy + p^2(x^2 - 1) = m^2$

3) Solve $(D^3 + D^2 - D - 1)y = \cos 2x$.

4) Solve $x^3 \frac{d^3y}{dx^3} + 3x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = x + \log x$

5) Solve $(x+a)^2 \frac{d^2y}{dx^2} - 4(x+a)\frac{dy}{dx} + 6y = x$

6) Solve $Dx - 3x - 2y = 0$; $Dy + 5x + 3y = 0$

7) Solve $\frac{d^2y}{dx^2} + (2\cos x + \tan x)\frac{dy}{dx} + y\cos^2 x = \cos^4 x$ by changing the independent variable.

8) Show that $x^2\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 2x$. is exact, and hence solve it.
