

J.D.B Govt. Girls College, Kota
Sample Question Paper
B.Sc. Part II
P-I Theory of Convergence

Max. Marks-20

Q.1 Attempt all questions(each question for 01 marks)

- (a) State the Dirichlet test.
- (b) Define absolute series and prove that $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \dots$ is convergent but not absolute convergent.
- (c) Define uniform convergence.
- (d) Define countable and uncountable set.
- (e) Define Finite set with example.

Q.2 Short answer questions (each question for 02 marks)

- (a) Show that series $\sum (-1)^n \left[\sqrt{(n^2 + 1)} - n \right]$ is conditionally convergent.
- (b) Prove that series $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$ is convergent.
- (c) Show that an analytic function with constant modulus is constant.
- (d) Prove that following series oscillates between $-\infty$ to ∞

$$1-2+3-4+5-6+\dots$$

- (e) Test the convergence of following series $\sum (-1)^n \sin(1/n)$

Q.3 Descriptive Questions (05 marks)

- (a) Prove that following series is uniform convergent

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1} x^n}{n!}; x \in [0, 1]$$

Janki Devi Bajaj Government Girls College, Kota
Sample Question Paper
B.Sc. Part III
P-II Differential Equation

Max. Marks-20

Q.1 Attempt all questions

(a) Define complementary function and particular integral.

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

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

(d) Solve $x^2 \frac{d^3y}{dx^3} = \frac{6y}{x^3}$

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

Q.2 Short answer questions

(a) Describe second order linear differential equation and write its general form.

(b) $\frac{d^2y}{dx^2} - 2 \tan x \frac{dy}{dx} + 5y = e^x \sec x$

(c) Solve the differential equation $\sin^2 x \frac{d^2y}{dx^2} = 2y$, where one solution $y = \cot x$ is given

(d) solve $\frac{d^2y}{dx^2} - x^2 \frac{dy}{dx} + xy = x$

(e) Solve $(1-x^2) \frac{d^2y}{dx^2} + x \frac{dy}{dx} - y = x(1-x^2)^{3/2}$

Q.3 Descriptive Questions

(a) Solve $\frac{d^2y}{dx^2} - \cot x \frac{dy}{dx} - (1 - \cot x)y = e^x \sin x$

Janki Devi Bajaj Government Girls College, Kota
Sample Question Paper
B.Sc. Part II
P-III Mechanics

Max. Marks-20

Q.1 Attempt all questions

- (a) Write Hook's law for elastic string.
- (b) Define terminal velocity.
- (c) Write horizontal motion equation of a particle under resistance proportional to some function of velocity
- (d) Define modulus of elasticity.
- (e) Define the projectile.

Q.2 Short answer questions

- (a) Describe the radial and transverse velocities with diagram.
- (b) Define tangential and normal acceleration in intrinsic forms.
- (c) Show that

1. Tangential velocity $= \frac{ds}{dt}$

2. Normal velocity $= 0$

- (d) Prove that the acceleration of a point moving in a plane curve with uniform speed is $\rho\dot{\psi}^2$
- (e) If the tangential and normal acceleration of a moving particle be always equal, prove that the velocity varies as e^{ψ}

Q.3 Descriptive Questions

- (a) Particles describe equiangular spiral $r = ae^{m\theta}$ with constant speed. Find the radial and transverse components of velocity and acceleration.