(b) Find inverse laplace transform of : **4**

$$\frac{(s+1)^2}{(s+2)(s+3)}.$$

**Unit IV**

**8.** (a) Find the complex Fourier transform of $e^{-(x)}$. **4**

(b) Find the fourier sine and cosine transform $e^{-ax}$. **4**

**9.** Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subjected to : **8**

(i) $u(0, t) = 0$

(ii) $u(x, 0) = \begin{cases} 1 & 0 < x < 1 \\ 0 & x \geq 1 \end{cases}$

(iii) $u(x, t)$ is bounded.

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**No. of Printed Pages : 04** **Roll No. .....**

# 52278

## B. Sc. EXAMINATION, 2026

(Fourth Semester)

(Re-appear Only)

MATH Paper–BM-242

Special Functions and Integral Transforms

*Time :* 3 *Hours*] [*Maximum Marks :* 40

Before answering the question-paper, candidates must ensure that they have been supplied with correct and complete question-paper. No complaint, in this regard will be entertained after the examination.

**Note** : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

**(Compulsory Question)**

**1.** (a) Define power series. **1**

(b) Define analytic function. **1**

(c) Expression for $J_3(x)$ in terms of $J_0(x)$. **2**

(d) What is the value of $\sqrt{(n+1)}, \sqrt{n}\,\sqrt{1-n}$. **2**

(e) Define laplace transform of function. **2**

## Unit I

**2.** Find series solution of differential equation **8**

$$x^2 \frac{d^2y}{dx^2} + (x + x^2) \frac{dy}{dx} + (x - 9)\, y = 0.$$

**3.** (a) Solve the differential equation : **4**

$$x \frac{d^2y}{dx^2} + \frac{dy}{dx} + \frac{1}{4} y = 0.$$

(b) Prove that : **4**

$$\int x J_0^2(x)\, dx = \frac{x^2}{2} \left[ J_0^2(x) + J_1^2(x) \right] + c.$$

## Unit II

**4.** (a) Show that the legendre polynomial :

$$P_u\ (x) = f\ [35x^4 - 30x^2 + 3]$$



satisfies the legendre equation when parameter $n = 4$. **4**

(b) Show that : **4**

$$P_5(x) = \frac{1}{8}\ (63x^5 - 70x^3 + 15x).$$

**5.** (a) Prove that : **4**

$$H_{2n}(0) = (-1)^n \frac{(2n)!}{n!},\ H_{2n+1}(0) = 0.$$

(b) Evaluate : **4**

$$\int_{-\infty}^{\infty} x e^{-x^2}\ H_n(x)\, H_m(x) dx.$$

## Unit III

**6.** (a) Find the Laplace transform of $t^2\ e^t$ Sin $4t$. **4**

(b) Evaluate : **4**

$$e^{-t} \cos^2 t \cdot$$

**7.** (a) Evaluate : **4**

$$L \left[ \int_0^t \frac{\sin t}{t}\, dt \right].$$