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(20524) Roll No.  
B.Sc.(Com.Sci.)-II Sem.

**NP-3589**

**B.Sc. (Com. Science)**  
**Examination, May-2024**  
**APPLIED MATHEMATICS-II**

**(BCS-202)**

*Time : Three Hours ] [Maximum Marks : 75*  
**Note :** Attempt questions from **all** the sections as per instructions.

**Section-A**

**Note :** Attempt **all** questions. Each question carries 3 marks.  $5 \times 3 = 15$

1. Solve :  $(1+x^2) dy = (1+y^2) dx$
2. Find the ordinary point of the following differential equation

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

**P.T.O.**

3. Find the Laplace Transform of  $(t+t^2)$ .
4. Find the value of  $a_0$  for  $f(x) = x, 0 < x < 2\pi$ .
5. Classify the given partial differential equation  
$$3 \frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0$$

**Section-B**

**Note :** Attempt any **two** questions out of the following 3 questions. Each question carries  $7\frac{1}{2}$  marks.  $2 \times 7.5 = 15$

6. Solve  $\frac{d^2y}{dx^2} - 4 \frac{dy}{dx} + 3y = e^{2x} + \cos x$

7. Evaluate :

$$\int_0^{\infty} t e^{-3t} \sin t dt$$

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8. Using the method of separation of variables, solve

$$\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$$

where  $u(x,0) = 6e^{-3x}$

### Section-C

**Note :** Attempt any **three** questions out of the following 5 questions. Each question carries 15 marks.  $3 \times 15 = 45$

9. (a) Solve :  $(D^2 - 2D)y = e^x \sin x$   
(b) Solve :  $(D^2 + 2D + 1)y = x \cos x$
10. Define Legendre's differential equation and prove Rodrigue's formula

$$P_n(x) = \frac{1}{n! 2^n} \frac{d^n}{dx^n} (x^2 - 1)^n$$

11. (a) Using Convolution Theorem

$$\text{Find } L^{-1} \left\{ \frac{1}{s(s^2 + a^2)} \right\}$$

(b) Find  $L^{-1} \left\{ \tan^{-1} \left( \frac{1}{s} \right) \right\}$

12. (a) Obtain a fourier expansion for  $f(x) = x^3, -\pi < x < \pi$   
(b) Expand  $f(x) = e^x$  as a fourier cosine series over the interval  $(0,1)$ .

13. Define one dimension heat equation and find the solution of

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} \text{ with}$$

boundary condition  $u(x,0) = 3 \sin n\pi x,$

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

where  $0 < x < l.$