

Roll No.

Total No. of Questions : 10]

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J-729[5374]

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B.Pharmacy (Semester - 2nd)

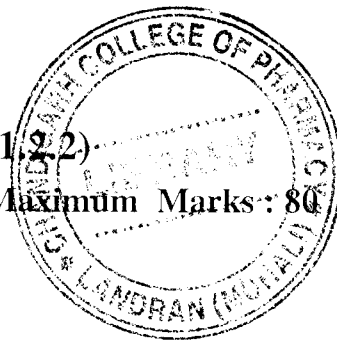
ADVANCED MATHEMATICS (PHM - 1, 2, 2)

Time : 03 Hours

Maximum Marks : 80

Instruction to Candidates:

- 1) Section - A is **compulsory**.
- 2) Attempt any **Four** questions from Section - B.
- 3) Attempt any **Three** questions from Section - C.



Section - A

Q1)

(15 x 2 = 30)

- a) Form the differential equation of simple harmonic motion given by $x = A \cos(nt + \alpha)$.
- b) Solve $\frac{dy}{dx} = e^{3y-2x} + x^2 e^{-2y}$.
- c) Find the degree and order of the D.E. $\left(\frac{d^2y}{dx^2}\right)^4 + \left(\frac{d^3y}{dx^3}\right)^{7/2} x - 7y = \cos x$.
- d) What are the applications of D.E.?
- e) Find C.F of the D.E. $(D^2 - 1)y = x \sin 3x + \cos x$.
- f) Find the orthogonal trajectories of parabola $y = ax^2$.
- g) State and prove change of scale property.
- h) Define the Laplace transform.
- i) Find the Laplace transform of the function $F(t) = 1$.
- j) Find the Laplace transform of the function $F(t)$. Where

$$F(t) = \begin{cases} \sin t & 0 < t < \pi \\ 0 & t > \pi \end{cases}$$

- k) Find the probability of getting a 9 exactly, once in 3 throws with a pair of dice.
- l) Find the probability of guessing correctly at least 6 of the 10 answers on a true or false examination.
- m) Find the moment generating function of a Random variable X which is binomially distributed.
- n) How that if a binomial distribution with $n=100$, is symmetric, it's coefficient of Kurtosis is 2.9?
- o) Find the probability of getting more than 25 "sevens" in 100 tosses of a pair dice.

Section - B

(4 x 5 = 20)

Q2) Solve $\frac{dx}{dt} + 2x - 3y = 5t$.

$$\frac{dy}{dt} - 3x + 2y = 2e^{2t}.$$

Q3) Solve $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = \log x$.

Q4) State and prove convolution theorem.

Q5) Prove that $L\left\{\frac{\sin t}{t}\right\} = \tan^{-1} \frac{1}{p}$ and hence Find $L\left\{\frac{\sin at}{t}\right\}$. Does the Laplace transform of $\frac{\cos at}{t}$ exist?

Q6) Find the moment generating function for the general normal distribution.

Section - C

(3 x 10 = 30)

Q7) Solve $(1+x)^2 \frac{d^2y}{dx^2} + (1+x) \frac{dy}{dx} + y = 4 \cos \log(1+x)$.

Q8) Use the convolution theorem to find $L^{-1} \left\{ \frac{1}{(p-2)(p^2+1)} \right\}$.

Q9) Prove that if X_1 and X_2 are independent poisson variables with respective parameters λ_1 and λ_2 then $X_1 + X_2$ has a poisson distribution with parameter $\lambda_1 + \lambda_2$. (Hint : Use the moment generating function).
Generalize the result to n variables.

Q10) Solve $(D^2-1)y = x \sin x + (1+x^2)e^x$.

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