SUBJECT CODE : MT/AC/MC23

B. Sc. DEGREE EXAMINATION, APRIL 2007
BRANCH IV – CHEMISTRY
SECOND SEMESTER

COURSE   : **ALLIED CORE**
PAPER   : **MATHEMATICS FOR CHEMISTRY-II**
TIME   : **3 HOURS**   **MAX. MARKS : 100**

SECTION – A
ANSWER ALL QUESTIONS :   **(10X2=20)**

1. Solve $(D^2 + D + 1)y = 0$
2. Solve $(D^2 - 3D + 2)y = 2$
3. Solve $(D^2 - 6D + 9)y = e^x$
4. Find $L(\sin 3t \sin 2t)$
5. Find $L^{-1}\left(\dfrac{1}{(s+1)^2 + 1}\right)$
6. Find $L(t^2 e^{-2t})$
7. If $f(x)$ is an odd function in the interval $-\pi < x < \pi$ then write the Fourier expansion for $f(x)$.
8. A bag contains 5 white and 3 black balls. Two balls are drawn at random one after the other without replacement. Find the probability that both balls drawn are black.
9. Prove that $r = \pm\sqrt{bxybyx}$
10. Write any two properties of correlation coefficients.

SECTION – B
ANSWER ANY FIVE QUESTIONS   **(5X8=40)**

11. Solve $(D^2 - D + 1)y = x^3 - 3x^2 + 1$
12. Solve $(D^2 - 4D + 3)y = x^3 e^{2x}$
13. Find the Laplace transform of

    (i) $\cos^4 t$ (ii) $e^t\left(\cosh 2t + \dfrac{1}{2}\sinh 2t\right)$

14. Find $L^{-1}\left[\dfrac{s-3}{s^2 + 4s + 13}\right]$

15. Obtain a Fourier expansion for the function
    $f(x) = \pi^2 - x^2, \ = \pi < x < \pi$

16. A problem in statistics is given to five students A, B, C, D and E. Their chances of solving it are $\dfrac{1}{2}, \dfrac{1}{3}, \dfrac{1}{4}, \dfrac{1}{5}$ and $\dfrac{1}{6}$. What is the probability that the problem will be solved.

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17.   Ten participants in a contest are ranked by two judges as follows.

x	1	6	5	10	3	2	4	9	7	8
y	6	4	9	8	1	2	3	10	5	7

Calculate the rank correlation coefficient.

SECTION – C
ANSWER ANY TWO QUESTIONS   (2X20=40)

18.   a) Solve $(D^2 + 3D + 2)y = e^{2x} + x^2 + \sin x$ (10)

b) Solve $(D^2 - 4D - 12)y = \sin x \sin 2x$ (10)

19.   a) Solve $\dfrac{d^2 y}{dx^2} + 4\dfrac{dy}{dx} - 5y = 5$ given that $y = 0$, $\dfrac{dy}{dx} = 2$ when $x = 0$ (12)

b) If $f(x) = \begin{cases} kx & 0 \le x \le \pi/2 \\ k(\pi - x) & \pi/2 \le x \le \pi \end{cases}$

Show that $f(x) = \dfrac{4k}{\pi}\left[\dfrac{\sin x}{1^2} - \dfrac{\sin 3x}{3^2} + \dfrac{\sin 5x}{5^2} - ...\right]$ and deduce that

$\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + ... = \pi/8$ (8)

20.   a) From the following data obtain the two regression equations

x	6	2	10	4	8
y	9	11	5	8	7

(15)

b) In a partially destroyed laboratory record, only the lines of regression of y on x and x on y are available as $4x - 5y + 33 = 0$ and $20x - 9y = 107$ respectively. Calculate $\bar{x}, \bar{y}$ and the coefficient of correlation between x and y.

(5)

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