FACULTY OF ENGINEERING

B.E 2/4 (CE/EE/Inst/M/P/AE/CSE)I–Sem (Backlog) Examination, December, 2017

Subject : Mathematics – III

Time : 3 Hours   **Max. Marks : 75**

Note: Answer all questions from Part – A & Any five questions from Part – B.

Part - A (25 Marks)

1. Eliminate the arbitrary functions f and g to obtain a partial differential equation from
   $z = f(x^2 - y) + g(x^2 + y)$. (3)

2. Solve $q(1 + p) = pz$. (2)

3. Find the half range sine series of the function
$$f(x) = \begin{cases} x, & 0 < x < 2 \\ 2, & 2 \le x \le 4 \end{cases}$$
   (3)

4. Solve $4\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} = 3u$ (2)

5. Two dices are thrown. What is the probability that the sum on the faces of the two dice is greater than 8. (3)

6. Let X be a random variable with the following probability distribution (2)

x	0	1	2	3
P (X = x)	1/3	1/2	1/24	1/8

   Then find E(x), E(x²).

7. Six coins are tossed 1280 times. Find the probability of getting 6 heads 100 times using Poisson distribution. (3)

8. Find the moment generating function of t^2 – distribution (2)

9. Show that the correlation coefficient is the geometric mean of the regression coefficients. (3)

10. Fit a straight line y = a + bx to the following data (2)

X	-1	2	3	5
Y	-1	11	15	23

Part - B (50 Marks)

11. a) Find a complete integral of the equation $2(z + xp + yq) = yp^2$ by using charpit's method. (5)

    b) Solve $(x + 2z)p + (4xz - y) = 2x^2 + y$ (5)

12. Find the Fourier series for the function (10)

$$f(x) = \begin{cases} \Pi x, & 0 \leq x \leq 1 \\ \Pi(2-x), & 1 \leq x \leq 2 \end{cases}$$

And hence show that $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + \ldots = \dfrac{\Pi^2}{8}$

13. Solve $\dfrac{\partial^2 u}{\partial t^2} = c^2 \dfrac{\partial^2 u}{\partial x^2}$, $0 < x < l, t > 0$ Subject to $u(0,t) = u(l,t) = 0$: (10)

$u(x,0) = x(l-x)$, $\dfrac{\partial u}{\partial t}(x,0) = 0$.

14. a) State Baye's theorem.

b) A bag X contains 2 white and 3 red balls and another bag Y contains 4 white and 5 red balls. one ball is drawn at random from one of the bags and is found to be red. Find the probability that it was drawn from the bag Y. (3+7)

15. Let X be a variable which follows a normal distribution with mean 25 and standard deviation 6. Then find the following

(i) P(x < 28) (ii)P(x > 30) (iii) P(x < 20) (iv) P($|x - 25| < 4$)

(Given P (0 < Z < 0.5) = 0.19146 ; P (0< Z < 0.833) = 0.2961;

P (0< Z< 0.667) = 0.2454) (10)

16. A dice is thrown 102 times and the following distribution of faces is obtained

Face	1	2	3	4	5	6
Face frequency	15	25	16	20	12	14

Can we conclude that all faces are equally likely to occur? Test at 5% level of significance (Give t_5^2 (0.05) = 11.07). (10)

17. a). Fit a curve $y = a + bx + cx^2$ to the following data (5)

X	-1	0	1	2	3	7
Y	9	7	7	9	13	49

b) Show that the correlation coefficient(r) is less than the arithmetic mean of the regression coefficients (where r > 0). (5)

****