

EX/PRN/MATH/ T/121/2018  
B.PRINTING ENGG. Examination, 2018  
(1ST YR, 2ND SEM)

MATHEMATICS

PAPER - II R

Full Marks : 100

Time: Three hours

Notations/Symbols have their usual meaning.

Answer question one and any six questions.

$$4 + 16 \times 6 = 100$$

1. Expand  $\theta$  in powers of  $\tan \theta$ .

(4)

2. (a) Solve

(5+5+6)

$$3z^2 + 2 = 0.$$

- (b) If

$$x + \frac{1}{x} =$$

show that

$$x^7 + \frac{1}{x^7} = -2.$$

- (c) If

$$(x + iy)^{\frac{1}{3}} = a + ib,$$

then show that

$$4(a^2 - b^2) = \frac{x}{a} + \frac{y}{b}$$

3. (a) Expand by Laplace's method to prove that

(8+8)

$$\begin{vmatrix} a & -b & -a & b \\ b & a & -b & -a \\ c & -d & c & -d \\ d & c & d & c \end{vmatrix} = 4(a^2 + b^2)(c^2 + d^2).$$

(b) Solve by Cramer's rule

$$ax + by + cz = 2, \quad cx + ay + bz = 0, \quad bx + cy + az = 0$$

4 (a) Find the analytic function  $f(z) = u + iv$  of which the real part

$$u = e^x(x \cos y - y \sin x).$$

(8+8)

(b) Find the Laurent's series

$$f(z) = \frac{1}{z^2(z-1)}$$

for

$$(i) \ 0 < |z| < 1, (ii) \ |z| > 1 \quad (iii) \ |z-1| > 1.$$

5. (a) Define with examples of Pole and Essential singularity.  
Evaluate

$$\int_0^\infty \frac{x^2 dx}{x^4 + a^4}$$

(10+6)

(b) Find the eigen values and eigen vectors of

$$A = \begin{bmatrix} 1 & -6 & -4 \\ 0 & 4 & 2 \\ 0 & -6 & -3 \end{bmatrix}$$

(8+8)

6. (a) Find the angle of intersection between two curves

(8+8)

$$x^2 + y^2 = \sqrt{2}, \quad x^2 - y^2 = a^2.$$

(b) Find the range of values of  $x$  for which

$$y = x^4 - 6x^3 + 12x^2 + 5x + 7$$

concave upwards or downwards and also find the point of inflexion.

7. (a). Find the equation of the plane through the points  $(1, 0, -1)$  and  $(3, 2, 2)$  and parallel to the straight line

(8+8)

$$\frac{x-1}{1} = \frac{1-y}{2} = \frac{z-2}{3}.$$

(b) Find the equation of tangent and normal to the curve

$$(ax)^2 + (by)^2 = 1, \text{ at } (1, 1).$$

8. (a) Let  $A$  and  $B$  are two independent events. Show that

(6+7+3)

(i)  $A^c$  and  $B$ (ii)  $A$  and  $B^c$ 

are also independent.

(b) If  $A$  and  $B$  are two events in a sample space  $S$  such that

$$P(A \cap B^c) = \frac{1}{3}, \quad P(A \cap B) = \frac{2}{3}.$$

Find  $P(B)$ . $[B^c$  is complement of  $B]$ 

(c) What do you mean by conditional probability?

9. (a) Two unbiased dice are thrown together at random.  
Find the expected value of the total number of points shown up.

(5+5+6)

(b) A random variable has the following probability distribution:

x:	1	2	3
p(x):	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{6}$

Find the expectation and variance of the random variable x.

(c) Find mean of Binomial distribution.