

**FACULTIES OF ENGINEERING & INFORMATICS**

**B.E. I - Year (Old) Examination, May/ June 2015**

**Subject : Mathematics - II**

**Time : 3 hours**

**Max. Marks : 75**

**Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.**

**PART A (25 Marks)**

1 Form the differential equation by eliminating the arbitrary constant 'c' from the family of curves  $y = c(x+c)^2$ . 2

2 Solve  $y x \frac{dy}{dx} = 3(1-x)^2 \frac{dy}{dx}$  3

3 Solve  $(D^4 + 8D^2 + 16)y = 0$ , where  $D = \frac{d}{dx}$  2

4 Find the particular integral of  $(D^4 - a)y = x^4$ . 3

5 Find the Laplace transform of  $f(t) = \cos(at+b)$  where a, b are any two constants. 2

6 Find the inverse Laplace transform of 3

$$F(S) = \frac{S+6}{S^2+6S+13}$$

7 Classify the singular points of the differentialequation 2

$$x^3 y'' + 3x y' + 6y = 0$$

8 Express  $f(x)=3P_3(x)+2P_2(x)+1741P_0(x)$  as a polynomial in x, where  $P_m(x)$  is the legendre polynomial of order m: 3

9 Evaluate  $\int_0^a f(x-a)^{m-1} dx$  in terms of beta function, where m,n,a,b are positive constants. 2

10 Evaluate  $\int_0^1 x^m (1-x)^n dx$  3

**PART - B (50 Marks)**

11 a) Solve.  $\cos x \cdot \frac{dy}{dx} + y = \tan x$  5

b) Obtain the general solution and singular solution of the following Clairaut's equation. 5

$$y = x y' - 2$$

12 a) Find the general solution of the differential equation 5

$$y'' + 4y = 6 e^{-2x} \cos x$$

b) Find the general solution of the differential equation  $y'' + 4y = \sec 2x$ , by the method of variation of parameters. 5

13 a) Solve the initial value problem 5  
 $y'' - 4y' + 5y = \delta(t - 3), y(0) = 0, y'(0) = 0.$

b) Find the inverse Laplace transform of  $F(S) = \frac{1}{z \pm \dots}$  by using convolution theorem. 5

14 Obtain the series solution of the equation 10  
 $xy'' + \dots xy = 0$  about  $x = 0$  by the Frobenius method.

15 a) Evaluate the improper integrals using Gamma function 5  
 i)  $\int E^{-x^2} dx$

ii)  $\int_0^{7 \times 3} f(x) dx$

b) State and prove the orthogonality of Chebyshev polynomials (TO). 5

16 a) if the population of a country doubles in 0 years, in how many years will it treble under the assumption that the rate of increase is proportional to the number of inhabitants.

b) Solve  $\frac{d^2y}{dx^2} + 2 \frac{dy}{dx} + y = \dots$  5

17 a) Find the Laplace transform of the function 5  
 $\sin t$  if  $t < 7r$  and the period of  $f(t)$  is  $2n$ .  
 $0$  if  $t < 2.7r$

b) Show that  $(2n+1)x P_n(x) = (n+1) P_{n+1}(x) + n P_{n-1}(x)$  where  $P_n(x)$  is the Legendre polynomial of degree  $n$ . 5