

Instructions :

1. All Questions are Compulsory.
2. Each Sub-question carry 5 marks.
3. Each Sub-question should be answered between 75 to 100 words. Write every questions answer on separate page.
4. Question paper of 80 Marks, it will be converted in to your programme structure marks.

1. Solve any **four** sub-questions.

- a) Solve $ydx - xdy = \sqrt{x^2 + y^2} dx$ 5
- b) If the stream lines of a flow around a corner are $xy = c$ find their orthogonal trajectories. 5
- c) Solve $\frac{dy}{dx} + \frac{y \cos x + \sin y + y}{\sin x + x \cos y + x} = 0$. 5
- d) Find particular integral of $(D^3 + 1)y = \cos(2x - 1)$ 5
- e) $x \frac{dy}{dx} + y = x^3 y^6$ 5

2. Solve any **four** sub-questions.

- a) Solve by the method of undetermined coefficients
$$\frac{d^2 y}{dx^2} + 2 \frac{dy}{dx} + 4y = 2x^2 + 3e^{-x}$$
 5
- b) Develop $f(x)$ in Fourier series in the interval $(2, -2)$ if
$$f(x) = 0 \quad -2 < x < 0$$
$$= 1 \quad 0 < x < 2$$
 5
- c) Solve by the method of variation of parameters
$$y'' - 2y' + y = e^x \log x$$
 5
- d) Obtain a_n of the Fourier series for $f(x) = e^{-x}$ in the interval $0 < x < 2\pi$. 5
- e) Express $f(x) = x$ as a half range cosine series in $0 < x < 2$. 5

3. Solve any **four** sub-questions.

a) Evaluate $L\{t.e^{-2t}.\sin 2t\}$ 5

b) Apply convolution theorem to evaluate $L^{-1}\left\{\frac{s^2}{(s^2+a^2)(s^2+b^2)}\right\}$ 5

c) Find the Laplace Transform of $f(t) = \begin{cases} 1, 0 < t < 1 \\ t, 1 < t \leq 2 \\ 0, t > 2 \end{cases}$ 5

d) Find the inverse Laplace transform of $\frac{1}{s(s^2+a^2)}$ 5

e) Find the Laplace of $L\{S \text{ int}[U(t-\pi/4)-U(t-3\pi/4)]\}$ 5

4. Solve any **four** sub-questions.

a) Assuming that the diameters of 1000 brass plugs taken consecutively from a machine, from a normal distribution with mean 0.7515cm and standard deviation 0.0020cm. How many of the plugs are likely to be rejected if the approved diameter is $0.752 \pm 0.004\text{cm}$? 5

b) Two persons A and B toss an unbiased coin alternately on the understanding that the first who gets the head wins. If A starts the game, find their respective chances of winning. 5

c) Out of 800 families with 5 children each, how many would you expect to have (a) 3 boys, (b) 5 girls, (c) either 2 or 3 boys? Assume equal probabilities for boys and girls. 5

d) The probability that a pen manufactured by a company will be defective is 1/10. If 12 such pens are manufactured, Find the probability that 5

i) Exactly two will be defective.

ii) At least two will be defective.

e) A random variable has a normal distribution with 10 as standard deviation. Find its mean if the probability that the random variable takes a value less than 80.5 is 0.3246. 5

