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322351(14)

B. E. (Third Semester) Examination, April-May 2021

(New Scheme)

(CSE Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of each question is compulsory. Attempt any* ***two*** *part from (b), (c) and (d) of each question.*

1. (a) Explain Dirichlet's conditions for a fourier expansion of function. 2

(b) Find a series of sines and cosines of multiples of x which will represent the function $f(x) = x + x^2$ in the interval $-\pi < x < \pi$. Hence show that

$$\frac{\pi^2}{6} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \text{.........}$$ 7

(c) Find the fourier series for the function $f(x)$, if

$f(x) = |\cos x|$ in $-\pi < x < \pi$. 7

(d) Find out the constant term and the coefficient of the first sin c and cosin c terms in the fourier series of y as given in the following table : 7

x	:	0	1	2	3	4	5
y	:	9	18	24	28	26	20

2. (a) $L^{-1}(\sqrt{t}) = \text{..........}$ 2

(b) (i) $\int_0^\infty t\, e^{-2t} \cos t \, dt = \frac{3}{25}$ 3

(ii) Prove that

$$L^{-1}\left\{\frac{4S+5}{(S-1)^2 \ (S+2)}\right\} = 3te^t + \frac{e^t}{3} - \frac{e^{-2t}}{3}$$ 4

(c) Apply Convolution theorem to evaluate :

$$L^{-1}\left[\frac{S^2}{(S^2+a^2)(S^2+b^2)}\right]$$ 7

(d) Solve

$$\frac{d^2x}{dt^2} + 8x = \cos 2t,$$

if $x(0) = 1$, $x(\pi/2) = -1$. 7

3. (a) State Cauchy's integral formula. 2

(b) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin even though C. R. equation are satisfied thereof. 7

(c) Evaluate :

$$\oint_c \frac{e^z}{\left(z^2+\pi^2\right)^2} dt$$

where C is $|z| = 4$. 7

(d) Show that :

$$\int_0^{2\pi} \frac{\cos 2\theta \, d\theta}{1-2a\cos\theta + a^2} = \frac{2\pi a^2}{1-a^2}\left(a^2 < 1\right)$$ 7

4. (a) From the partial differential equation from

$$z = y^2 + 2t\left(\frac{1}{x} + \log y\right)$$ 2

(b) Solve :

$$\left(x^2 - yz\right)p + \left(y^2 - zx\right)9 = z^2 - xy$$ 7

(c) Solve :

$$r - 4x + 4t = e^{2x+y}$$ 7

(d) Using the method of separation of variables, solve :

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u, \text{ where } u(x,0) = 6\,e^{-3x}.$$ 7

5. (a) Define moment generating function of discrete and continuous probability distribution. 2

(b) In sampling a large number of parts manufactured by a machine, the mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain at least 3 defective parts. 7

(c) Fit a Poission distribution to the set of observations :

x	: 0	1	2	3	4
f	: 122	60	15	2	1

7

(d) In a normal distribution, 31% of the items are under 45 and 8% are over 64. Find the mean and SD of the distribution. 7