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322351(14)

B. E. (Third Semester) Examination, April-May, 2016

(New Scheme)

(CSE Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *In each question solve part (a) and any **two** from parts (b), (c) and (d). Part (a) is of 2 marks and other parts are of 7 marks each.*

1. (a) The mean value of $f(x)\cdot \cos nx$ in $(0,2\pi)$ is 2

(b) Given that

$f(x) = x + x^2$ for $-\pi < x < \pi$

find the Fourier expression of $f(x)$. 7

Deduce that $\dfrac{\pi^2}{6} = 1 + \dfrac{1}{2^2} + \dfrac{1}{3^2} + \dfrac{1}{4^2} + \ldots\ldots\ldots$

(c) Obtain the Fourier series for 7

$$f(x) = \begin{cases} -x + 1, \text{ for } -\pi \le x \le 0, \\ x + 1, \text{ for } 0 \le x \le \pi \end{cases}$$

(d) Obtain the Fourier expansion of $x \sin x$ as a cosine series in $(0, \pi)$. 7

Hence show that

$$\frac{1}{1\cdot 3} - \frac{1}{3\cdot 5} + \frac{1}{5\cdot 7} - \ldots\ldots \infty = \frac{\pi - 2}{4}$$

2. (a) Find

$$L^{-1}\left\{\cot^{-1}(s/2)\right\}.$$ 2

(b) Find Laplace Transform of

$$2t + \frac{\cos 2t - \cos 3t}{t} + t \sin t.$$ 7

(c) Find inverse Laplace transform of

$$\frac{s}{s^4 + s^2 + 1}.$$ 7

(d) Solve the following initial value problem

$$y'' + y = \sin 3t$$

where $y(0) = 0; y'(0) = 0$. 7

3. (a) Determine the poles and residue at each pole of the function $f(x) = \cot z$. 2

(b) If $u - v = (x - y)(x^2 + 4xy + y^2)$ and $f(z) = u + iv$ is an analytic function of $z = x + iy$, find $f(z)$ in terms of z. 7

(c) Evaluate the following integral using Cauchy integral formula

$$\int_C \frac{4 - 3z}{z(z-1)(z-2)} dz$$

where C is the circle $|z| = 3/2$. 7

(d) Using complex variables, evaluate the integral

$$\int_0^{2\pi} \frac{d\theta}{1 - 2p\sin\theta + p^2}, \ (0 < p < 1)$$ 7

4. (a) Form the partial differential equation

$$z = e^{my}\phi(x - y).$$ 2

(b) Solve

$$(x^2 - y^2 - z^2)p + 2xyq = 2xz.$$ 7

(c) Solve

$$\frac{\partial^3 z}{\partial x^3} - 2\frac{\partial^3 z}{\partial x^3 \partial y} = 2e^{2x} + 3x^2 y.$$ 7

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

$$\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u,$$

where $u(x, 0) = 6e^{-3x}$. 7

5. (a) Determine the binomial distribution for which mean = 2(variance) and mean + variance = 3. Also find $P(X \leq 3)$. 2

(b) A manufacturer of air-mail envelopes knows from experience that the weight of the envelopes is normally distributed with mean 1·9 gm and standard deviation 0·01gm. About how many envelopes weighing

(i) 2 gm or more

(ii) 2·10 gm or more

can be expected in a given packet of 1000 envelopes. 7

(c) The diameter of an electic cable is assumed to be a continuous variate with p.d.f

$f(x) = 6x(1 - x);\ 0 \leq x \leq 1$V verify that the above is a p.d.f. Also find the mean and standard deviation. 7

(d) Fit a Poission distribution to the following : 7

x	:	0	1	2	3	4
f	:	46	38	22	9	1