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B. E. (Third Semester) Examination, April-May 2020/

NOV-DEC 2020

(New Scheme)

(IT Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note *: Question (a) of each unit is compulsory & carrying 2 marks. Solve any other* ***two*** *questions from each unit & carrying 7 marks.*

Unit-I

1. (a) Write Euler's formulae?

(b) For a function $f(x)$ defined by $f(x) = |x|$, $-\pi < x < \pi$, obtain a fourier series. Hence deduce that

$$\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots=\frac{\pi^2}{8}$$

(c) Obtain a half range cosine series for $f(x)$, where

$$f(x)=\begin{cases} kx, & 0\le x\le l/2 \\ k(l-x), & l/2<x\le l \end{cases}$$

Deduce the sum of the series

$$\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+..$$

(d) The turning moment T on the crack-shaft of q engine for each crank angle v is given as follows obtain the first 4 terms of a series of sine for T & find T when $\theta = 75°$.

θ	0	30	60	90	120	150	180
T	0	5224	8097	7850	5499	2626	0

Unit-II

2. (a) What is first shifting property of Laplace Transformation?

(b) Solve :

(i) $\dfrac{e^{at}-\cos bt}{t}$

(ii) $\int_0^\infty te^{-2t}\sin t\,dt$

(c) Show that

$$L^{-1}\left[\frac{S^2}{S^4+4a^4}\right]=\frac{1}{2a}[\cosh at\ \sin at+\sinh at\cos at]$$

Or

Use the convolution theorem to find

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

(d) Solve by method of transforms

$$ty''+2y'+ty=\sin t \text{ given } y(0)=1$$

Unit-III

3. (a) Define Cauchy-Riemann (C – R) equation.

(b) Evaluate

(i) $\int_C \frac{e^{2z}}{(z+1)^4} dz$, where c is the circle, $|z| = 2$

(ii) $\int_C \frac{\log z}{(z-1)^3} dz$, where c is $|z-1| = ½$

(c) By integration around a unit circle evaluate

$$\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta$$

Or

Find the analytic function whose real part is

$$\frac{\sin 2x}{\cosh 2y - \cos 2x}$$

(d) Find the Laurent series expansion of

$$\frac{z^2 - 6z - 1}{(z-1)(z-3)(z+2)}$$

where $3 < |z+2| < 5$.

Unit-IV

4. (a) Form the partial differential equations by eliminating the arbitrary functions

$$Z = f\left(x^2 - y^2\right)$$

(b) Solve :

$$px\left(z - 2y^2\right) = (z - qy)\left(y^2 + 2x^3\right)$$

(c) Solve : 7

$$\left(D^2 + 3DD' + 2D'^2\right)z = 24xy$$

(d) Using the method of separation of variables solve

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

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

Unit-V

5. (a) If a random variable has a poisson distribution such that $P(1) = P(2)$ find mean of the distribution.

(b) The probability diversity $p(x)$ of a continuous random variable is given by $p(x) = y_0 e^{-|x|}$, $-\infty, < x < \infty$ find. y_0, and mean.

(c) In a certain factory turning over razor blades, there is small chance of 0.002 for any blade to be defective. The blades are supplied in packets of 10. Use poisson distribution to calculate the approximate number of packets containing no defective, one defective & two defective blades in a consignment of 10,000 packets.

(d) Out of 800 families with 5 children each, how many would you expect to have 2 girls, 5 girls and either 2 or 3 boys?