Roll No. ....

300311(14)

B. E. (Third Semester) Examination, APR-MAY 2020

(Old Scheme)

(Chemical, Civil, Mechanical, Metallurgy, Mining Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) carries 2 marks and it is compulsory. Attempt any two parts from (b), (c) and (d) of each unit.*

Unit-I

1. (a) If $f(x)$ is an even function in $(-l, l)$, then the value of $b_n = -------$.   2

(b) Obtain Fourier series for the function 7

$$f(x)=\begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$$

Deduce that :

$$\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots\cdots\infty = \frac{\pi^2}{8}.$$

(c) Obtain a half range cosine series for 7

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

Deduce the sum of the series.

$$\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots\cdots\infty$$

(d) Obtain the first three coefficients in the Fourier cosine series for y, where y is given in the following table : 7

x:	0	1	2	3	4	5
y:	4	8	15	7	6	2

Unit-II

2. (a) $L\{e^{2t}\sin t\}=$ 2

(b) Evaluate : 7

(i) $\displaystyle\int_0^\infty e^{-t}\left(\frac{\cos at-\cos bt}{t}\right)dt$

(ii) $\displaystyle\int_0^\infty t\,e^{-3t}\sin t\,dt$

(c) Apply convolution theorem to evaluate : 7

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

(d) Solve by the method of transforms, the equation : 7

$$y'''+2y''-y'-2y=0$$

given $y(0)=y'(0)=0$ and $y''(0)=6$.

Unit-III

3. (a) The complementary function of : 2

$$r-7s+6t=e^{x+y} \quad \text{is} \quad \text{.............}$$

(b) Solve : 7

$$x^2(y-z)p + y^2(z-x)q = z^2(x-y)$$

(c) Solve : 7

$$(D^2 + 2DD' + D'^2 - 2D - 2D')Z = \sin(x+2y).$$

(d) Using the method of separation of variables, solve 7

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

Unit-IV

4. (a) Statement of Cauchy theorem. 2

(b) Evaluate $\int_c \frac{z^2 - z + 1}{z-1} dz$, where C is the circle 7

    (i) $|z| = 1$

    (ii) $|z| = \frac{1}{2}$

(c) Find the Laurents expansion of $f(z) = \dfrac{7z-2}{(z+1)z(z-2)}$

in the region $1 < z+1 < 3$. 7

(d) Show that : 7

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

Unit-V

5. (a) The mean of Binomial distribution with n observations and probability of success p is : 2

    (i) pq

    (ii) np

    (iii) $\sqrt{np}$

    (iv) $\sqrt{pq}$

(b) Find the moment generating function of the exponential distribution : 7

$$f(x) = \frac{1}{c} e^{-x/c}, \ 0 \le x \le \infty, \ c > 0.$$

Hence find its mean and S.D.

(c) Fit a Poisson distribution to the set of observations : 7

x :   0   1   2   3   4

y :   122   60   15   2   1

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