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# 322351 (14)

**BE (3rd Semester)**

**Examination, Nov.-Dec., 2014**

**Branch : Computer Science & Engg.**

## MATHEMATICS - III (NEW)

***Time Allowed : Three Hours***

***Maximum Marks : 80***

***Minimum Pass Marks : 28***

**Note :** Part (a) is compulsory in each unit. Attempt any two questions from (b), (c) and (d).

### Unit – I

**Q. 1.** (a) Write Euler's formulae for Fourier series. **2**

(b) Obtain Fourier series for **7**

$f(x) = x \quad 0 \le x \le \pi$

$2\pi - x \quad \pi \le x \le 2\pi$

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

(c) Obtain Fourier series for $f(x) = x \sin x$ in interval $(-\pi, \pi)$. 7

(d) The following values of y give the displacement in inches of a certain machine part for the rotation x of the flywheel. Expand y in terms of a Fourier series : 7

| x: | 0 | $\pi/6$ | $2\pi/6$ | $3\pi/6$ | $4\pi/6$ | $5\pi/6$ |
|---|---|---|---|---|---|---|
| y: | 0 | 9.2 | 14.4 | 17.8 | 17.3 | 11.7 |

**Unit – II**

**Q. 2.** (a) Find L cos(at + b). 2

(b) Find Laplace transform of 7

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

(ii) $\int_0^t e^{-t} \cos t \, dt$





(c) Find inverse Laplace transform of 7

(i) $\dfrac{s}{(s^2 + a^2)^2}$

(ii) $\tan^{-1}\left(\dfrac{2}{s}\right)$

(d) Solve by the transform method 7

$y'' + 4y' + 3y = e^{-t}$ $y(0) = y'(0) = 1$

**Unit – III**

**Q. 3.** (a) Write Cauchy's integral formula. 2

(b) If f(z) is a regular function of z, prove that

$$\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |f(z)|^2 = 4|f'(z)|^2$$ 7

(c) (i) Evaluate, using Cauchy's integral formula

$$\int_C \frac{3z^2 + 7z + 1}{z + 1} dz$$

where C is $|z| = 1/2$.

(ii) Find the Laurent's series expansion of

$\frac{z^2-1}{z^2+5z+6}$ about z = 0 in the region

$2 < |z| < 3$. 7

(d) Apply the calculus of residues, to prove that 7

$$\int_{-\infty}^{\infty} \frac{x^2\,dx}{(x^2+a^2)(x^2+b^2)} = \frac{\pi}{a+b}$$

**Unit – IV**

**Q. 4.** (a) Form the partial differential equation from

$z = ax + by + a^2 + b^2$ 2

(b) Solve $y^2p - xyq = x(z - 2y)$. 7

(c) Solve

$(D^3 + D^2D' - DD'^2 - D'^3)z = e^x \cos 2y$ 7





(d) Solve by the method of separation of variables

$3\frac{\partial u}{\partial x} + 2\frac{\partial u}{\partial y} = 0$

given $u(x, 0) = 4e^{-x}$. 7

**Unit – V**

**Q. 5.** (a) Define moment generating function. 2

(b) The frequency function of a continuous random variable is given by

$f(x) = y_0\, x(2 - x) \quad 0 \le x \le 2$

Find the value of $y_0$, mean and variance of x. 7

(c) A car hire firm has two cars which it hires out day by day. The number of demands for a car on each day is distributed as a poisson distribution with mean 1.5. Calculate the

proportion of days (i) on which there is no demand (ii) on which demand is refused. ($e^{-1.5} = 0.2231$) 7

(d) The mean height of 500 students is 151 cm and the standard deviation is 15 cm. Assuming that the heights are normally distributed, find how many students heights lie between 120 and 155 cm. 7