## **Question Paper**

Exam Date & Time: 16-Jun-2022 (02:00 PM - 05:00 PM)

MANIPAL INSTITUTE OF TECHNOLOGY MANIPAL (A constituent unit of MAHE, Manipal)

IV Semester End Semester Examination-June 2022- Engineering Mathematics IV (MAT 2255)

**ENGINEERING MATHEMATICS IV [MAT 2255]** 

Marks: 50

A)

B)

C)

A) B)

1)

2)

Duration: 180 mins.

Section Duration: 180 mins

**Descriptive Questions** 

## Answer all the questions.

Solve  $(x^3 + 1)y'' + x^2y' - 4xy = 2, y(0) = 0, y(2) = 4_{\text{with}} h = 0.5$ (4)using finite difference method Find the extremals of the functional  $\int_{x_0}^{x_1} \frac{(y_1)^2}{x^2} dx$ (3)In an examination 7% of students score less than 35% marks and 89% of students score less than (3) 60% marks. Find the mean and standard deviation if the marks are normally distributed. Find the moment generating function of the random variable which is uniformly distributed over (-a, (4) a). Hence evaluate  $E(X^{2n})$ Let  $\overline{X}$  be the mean of a random sample of size 15 from a distribution having p.d.f. (3) $< \overline{X} < \frac{4}{5}$ 

$$f(x) = 3x^2, 0 < x < 1$$
. Then by using central limit theorem find  $P(\frac{2}{5} < 1)$ 

C)

of

f(x) = 2x, 0 < x < 1.(3)

Suppose that X is a random variable with pdf given by  $Y = e^{-X}$ 

Find the pdf

(4)

A)

3)

Solve the transportation problem

Destination						
	А	В	С	D		
Source I	19	30	50	12	7	
Source II	70	30	40	60	10	Availability
Source III	40	10	60	20	18	
Requirement	5	8	7	15		

B) Derive the mean and variance of gamma distribution (3)

A distribution with unknown mean  $\mu$  has a variance  $\sigma^2=1.5$  . How large a sample should be C) (3) taken from the distribution in order that probability will be 0.95, that the sample mean will be within 0.5 of the population mean.

 $h = \frac{1}{3}$ 

Solve: 
$$u_{xx} + u_{yy} = -81x^2y^2$$
;  $u(x, 0) = u(0, y) = 0$  (4)

4)

A)

. . .

 $u(1,y) = u(x,1) = 100_{\text{with}}$ 

B) Show that the geodesics on a plane are straight lines.

C) Solve using graphical method.

Maximize  $Z = 5x_1 + 3x_2$  subject to

$$4x_1 + 5x_2 \le 1000 \ 5x_1 + 2x_2 \le 1000 \ 3x_1 + 8x_2 \le 1200 \ x_1, x_2 \ge 0.$$

A)

Let X and Y be two independent random variables with pdf's

$$f(x) = e^{-x}, x > 0, g(y) = 2e^{-2y}, y > 0$$
. Find the pdf of the random variable  $z = \frac{x}{y}$ 

B) A firm makes two products P1 & P2 and has production capacity of 18 tonnes per day. P1 & P2 (3) require same production capacity. The firm must supply at least 4 t of P1 & 6 t of P2 per day. Each tonne of P1 & P2 requires 60 hours of machine work each. Maximum machine hours available are 720. Profit per tonne for P1 is Rs. 160 & P2 is Rs. 240. Formulate a linear programming problem

C)

$$\frac{\partial^{2} u}{\partial t^{2}} = \frac{\partial^{2} u}{\partial x^{2}}, 0 < x < 1, t > 0_{\text{with}}$$

$$u(x,0) = 0, u_{t}(x,0) = 0, u(0,t) = u(1,t) = 100 sin\pi t_{. \text{Compute}} u$$
<sup>(3)</sup>

for 4 time steps with h = 0.25

-----End-----

(3)

(3)

(4)