(b) Solve in series the aquation

328411 (14)

BE (4th Semester) Examination, Nov-Dec 2021

Branch : AEI, EI, Et & T, Mechatronics

MATHEMATICS IV

Time Allowed : Three Hours

Maximum Marks : 80 Minimum Pass Marks : 28

Note : Part (a) of each question is compulsory. Attempt

any two part from (b), (c) and (d). Part (a) carries

2 marks. Part (b), (c) and (d) carry 7 marks

each. $x_0 = \frac{x_0}{x_0} (x_0 - x_0) + \frac{x_0}{x_0} (x_0 - x_0)$

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P.T.O.

- Q. 1. (a) Define Bessel's function.
 - (b) Solve in series the equation :

$$x\frac{d^2y}{dx^2} + \frac{dy}{dx} + xy = 0$$

(c) Prove that :

$$J_{5/2}(x) = \sqrt{\frac{2}{\pi x}} \left\{ \frac{3 - x^2}{x^2} \sin x - \frac{3}{x} \cos x \right\}$$

(d) Prove that :

$$(2n+1) P_n(x) = P'_{n+1}(x) - P'_{n-1}(x)$$

Q. 2. (a) State and explain linear partial differential

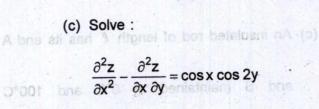
equation.

(b) Solve :

$$(mz - ny)\frac{\partial z}{\partial x} + (nx - \ell z)\frac{\partial z}{\partial y} = \ell y - mx$$

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to 0°C and

$$(D^{2} + 2DD' + {D'}^{2} - 2D - 2D')z = sin(x + 2y)$$

Q. 3. (a) Explain one dimensional heat flow.

(b) A string a stretched and fastened to two

points *l* apart motion is started by displacing

the string in the form $y = a \sin(\pi x/\ell)$ from

and x = A is initially in position given by which it is released at time t = 0. Show that

the displacement of any point at a distance x

from one end at time t is given by :

 $y(x, t) = a \sin (\pi x/\ell) \cos (\pi x t/\ell)$

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(c) An insulated rod of length ℓ has its end A

and B maintained at 0°C and 100°C

respectively until steady state conditions

prevails. If B is suddenly reduced to 0°C and

maintained at 0°C. Find the temperature at a

distance x from A at time t.

coints (abart motion is lianed inv distila

(d) A tightly stretched string with fixed end points

x = 0 and $x = \ell$ is initially in position given by

 $y = y_0 \sin^3 (\pi x/\ell)$ if it is released from rest

from this position. Find the displacement

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y(x, t). The third me is a (1 c).

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(5) Q. 4. (a) Define Z-transformobner enited (c) .3.0

(b) Find Z-transform of the following :

(b) A and B throw alternately with a pair of dice.

ℓ -an

(i)

A wins if he throws 6 before B throw 7 and 8

(ii) n sin xa

wins if he throws 7 before A throws 6. If A

(c) Find the inverse Z-transform of :

begins. Find his chance of winning.

(i)
$$\frac{2z^2 + 3z}{(z+2)(z-4)}$$

(ii) $\overline{(2-z)(3z-1)}$

company will be defective is to the such

(d) Using Z-transform

pens are manufactured. Find the probability Solve $y_{k+2} + 6y_{k+1} + 9y_k = 2^k$

that none will be defective.

given that $y_0 = y_1 = 0$

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(A) P.T.O.

Q. 5. (a) Define random variable.

(b) A and B throw alternately with a pair of dice.

A wins if he throws 6 before B throw 7 and B

wins if he throws 7 before A throws 6. If A

begins. Find his chance of winning.

(c) The probability that a pen manufactured by a

company will be defective is $\frac{1}{10}$. If two such

pens are manufactured. Find the probability

that none will be defective.

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(d) Fit a Poisson distribution to the following data

and test for its goodness of fit at level of

significance .05 x : 0 1 2 3 4 f : 419 352 154 56 19