Total No. of Questions : 9]

P1582

Time : 2¹/₂ Hours]

1)

2)

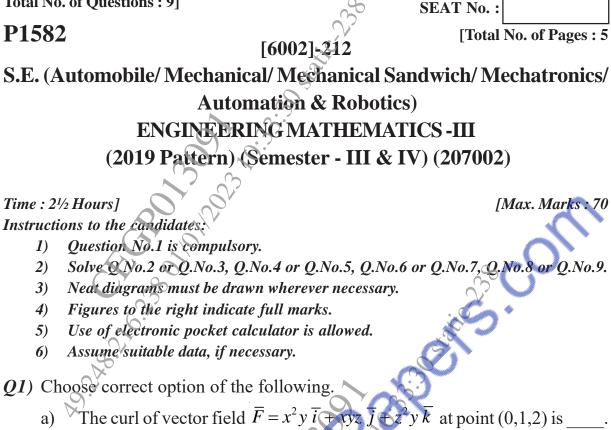
3)

4)

5)

6)

a)



i)
$$4\overline{i} - 2\overline{j} + 2\overline{k}$$

ii) $4\overline{i} + 2\overline{k}$
iv) $2\overline{i} + 4\overline{k}$

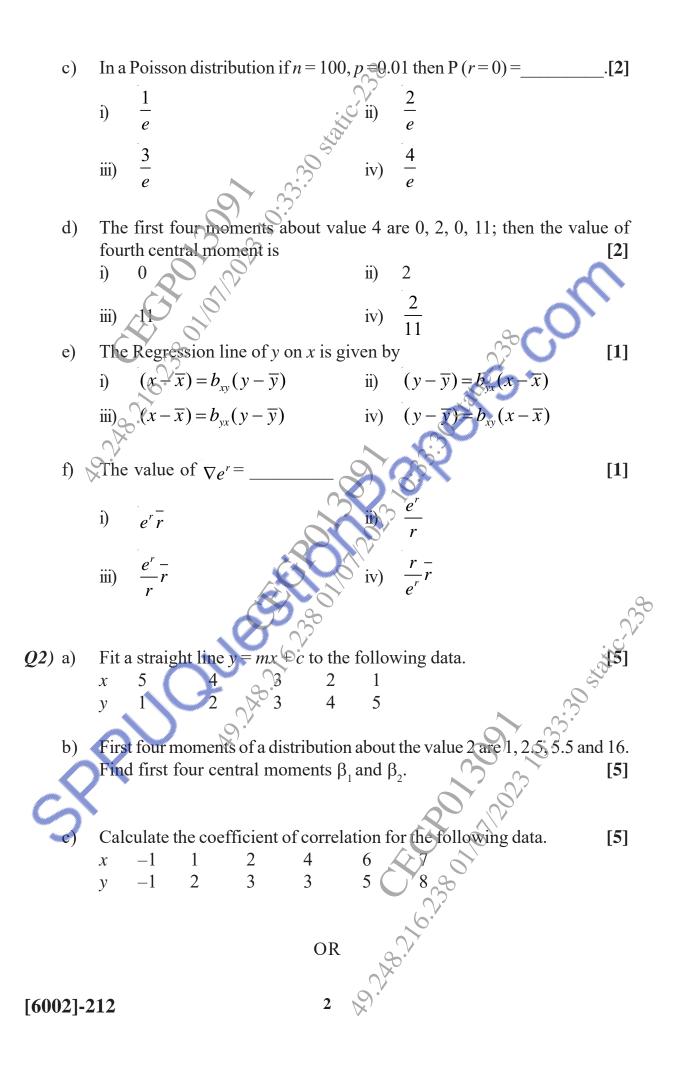
The most general solution of wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial r^2}$ subjected to **b**) [2] usual initial and boundary conditions I)

(*U*)_{t=0}
IV)
$$u(x, 0) = f(x)$$
 is $u(x, t) =$

- $(C_{1}\cos mx + C_{2}\sin mx) (C_{3}\cos cmt + C_{4}\sin cmt)$ $(C_{1}\cos mx + C_{2}\sin mx)$ $(C_{3}\cos cmt + C_{4}\sin cmt)$ $C_{1}e^{mx} + C_{2}e^{-mx}$ i)
- ii)
- iii)

iv)
$$C_1 e^{mx} + C_2 e^{-mx}$$

[2]



Q3) a) Fit a straight line of the form y = ax + b to the following data.

The first four moments of distribution about working mean 3.5 are 0.0375, **b**) 0.4546, 0.0609 and 0.5074. Calculate the first four central moments. [5]

8

7

5

[5]

Obtain regression line of the following data. c) 5 6 11

10

х

v

A series of five one day matches is to be played between India and **Q4**) a) Sritanka. Assuming that the probability of India's win in each match as 0.6 and result of all five matches is independent of each other. Find the probability that India wins the series. [5]

8

- The number of breakdowns of a computer in a week is a Poisson b) variable with $\lambda = np = 0.3$. What is the probability that the computer will [5] operate
 - i) with no breakdown
 - at most one breakdown in a week. ii)
- The life time of a certain component has a normal distribution with mean c) of 400 hours and standard deviation of 50 hours. Assuming a normal sample of 1000 components, find number of components whose life time lies between 340 to 465 hours [Given : A(z = 1.2) = 0.3849, (z = 1.3) = 0.4032]. [5]

OR

A coin is tossed 4 times. X denote the number of heads. Find the expectation of x. [5]

If 10% of the rivet's produced by the machine are defective, find the b) probability that out of 5 rivets chosen at random at least two will defective. [5]

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A die is tossed 300 times gave the following result. c)

Frequency 43 49 56 45 66 41	Score	1	2	3	. 4	5	6
	Frequency	43	49	56	45	66	41

Are the data consistent at 5% level of singificance with hypothesis that the die is unbiased? (Given : $\chi^{2}_{5,0.05} = 11.07$). [5]

- Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 3 = z$ at **Q6**) a) the point (2,5
 - Show that $\overline{F} = (ye^{xy} \cos z) \ \overline{i} + (xe^{xy} \cos z) \ \overline{j} e^{xy} \sin z \partial \overline{k}$ is irrotational. b) Find scalar potential function ϕ such that $\overline{F} = \nabla \phi$. [5]
 - Evaluate $\int_{C} \overline{F} \cdot d\overline{r}$ where $\overline{F} = x^{2}\overline{i} + xy\overline{j}$ where C is arc of parabola $y = x^{2}$ c) joining (0, 0) & (1, 1). [5]
- Find the directional derivative of $\phi = xyz$ in the direction normal to the **Q7**) a) surface $x^2y + xy^2 + yz^2$ at (1,1,1) [5]

QR

Solve any one. b) i) Prove that $\frac{a}{3}$ Prove that

 $dx \oplus \sin x \cos y \, dy$ -4 Evaluate by using Green's theorem $\int (\cos x \sin y)$ where C is $x^2 + y^2 = 1$.

- A homogeneous rod of conducting material of length 100 cm has its ends **Q8**) a) kept at zero temperature and the temperature initially is [8] $u(x, 0) = x, \ 0 \le x \le 50$
 - $= 100 x, 50 \le x \le 100.$

Find the temperature u(x, t) at any time

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[5]

A string is stretched and fastened to two points l apart, motion is stretched b) by displaying the string in the form $u = a \sin\left(\frac{\pi x}{l}\right)$ from which is released at time t = 0. Find the temperature distribution u(x, t) from one end. [7] OR

An infinitely long uniform metal plate is enclosed between lines y = 0 and **Q9**) a) y = l, for x > 0. The temperature is zero along the edges y = 0 and y = land at infinity. If the edge x = 0 is kept at a constant temperature u_0 , find the temperature distribution u(x, t). [8]

∂и Use Fourier sine transform to solve b) $x < \infty, t > 0.$ [7]

Subjected to

- $u(0, t) = 0, \forall t > 0.$ u(x, 0) = 1, 0 < x < 1
 - = 0, x > 1

u(x, t) is bounded. iii)

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