

GOVT. M.H.COLLEGE OF HOME SC. & SCIENCE FOR WOMEN AUTONOMOUS
JABALPUR (M.P.)

Code No. : OBS/401/M/20

M.Sc. IV SEMESTER ATKT EXAMINATION SEPT. - 2020

Subject : Mathematics
Paper – I
Operation Research

Max. Marks : 35

- Note : 1. Attempt all questions.
2. All questions carry equal marks.

- Q.1. (a) Explain applications of operations Research in Industry.
(b) State the different types of models used in operation Research. Explain briefly the general method for solving these operations Research models.
- Q.2. (a) Derive an Economic lot size formula with constant rate of demand, scheduling time is constant and shortages are allowed.
(b) Discuss a deterministic inventory model with multiple items and one constraint.
- Q.3. (a) Discuss the Policy of replacement of items whose maintenance cost increases with the time but the value of money remains constant during the period.
(b) What is replacement problem ? Explain individual and group replacement policy.
- Q.4. Explain the following in PERT/CPM –
(i) Earliest time (ii) Latest time (iii) Critical Path
(iv) Float
take an example and explain.
- Q.5. Define following terms –
(i) Competitive Game
(ii) Pure strategies.
(iii) Mixed strategies
(iv) Two person zero sum game.
(v) Pay off matrix.
(vi) Maximin and minmax criterion.
(v) Saddle point
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Code No. : OBS/402/M/20
M.Sc. IV SEMESTER ATKT EXAMINATION SEPT. - 2020

Subject : Mathematics
Paper – II
Spline Theory

Max. Marks : 35

- Note : 1. Attempt all questions.
2. All questions carry equal marks.

- Q.1. Discuss why polynomials are used for interpolation and limitation of polynomial approximation with the help Runge example.
- Q.2. Define Hat functions and show that $(H_i)_{i=1}^n$ forms a basis for S_2 . Prove that the least square approximation L_2g to $g \in C[a, b]$ by elements of S_2 satisfies $\|L_2g\| \leq 3 \|g\|$.
- Q.3. What is cubic spline interpolation ? State and prove the Pythagoras theorem for cubic spline interpolation.
- Q.4. Establish the existence and uniqueness of parabolic spline interpolant..
- Q.5. Show that the B-Spline Sequence (B_i) consists of nonnegative functions which sum up to 1.

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Code No. : OBS/403/M/20
M.Sc. IV SEMESTER ATKT EXAMINATION SEPT. - 2020

Subject : Mathematics
Paper – III
Programming in “C”

Max. Marks : 35

Note : 1. Attempt all questions.
2. All questions carry equal marks.

- Q.1. Explain the structure of 'C' Program. Also discuss different data types available in C Language.
- Q.2. How do relational and logical operators work ? Explain with example.
- Q.3. What is the need for loop statement ? Discuss the features of different loops available in 'C' Language.
- Q.4. What do you understand by function definition and declaration. Explain the concept of function parameters and how they are passed.
- Q.5. Explain pointer arithmetic with metric, giving example & discuss array of structures.

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Code No. : OBS/404/M/20

M.SC. IV SEMESTER ATKT EXAMINATION SEPT. - 2020

Subject : Mathematics
Paper – IV
Advanced Special Function - II

Max. Marks : 35

- Note : 1. Attempt all questions.
2. All questions carry equal marks.

- Q.1. (a) State and prove Rodrigue's formula for $P_n(x)$.
(b) Establish the Christeffel's expansion.
 $P_n'(x) = (2n-1)P_{n-1} + (2n-5)P_{n-3} + (2n-9)P_{n-5} \dots$
last term of the series being $3P_1$ or P_0 according as n is even or odd.

- Q.2. (a) Prove that –

$$\int_{-1}^1 P_m(x) P_n(x) dx = \begin{cases} 0, & \text{if } m \neq n \\ \frac{2}{2n+1}, & \text{if } m = n \end{cases}$$

- (b) Express $P(x) = x^4 + 2x^3 - x - 3$ in terms of Legendre polynomials.

- Q.3. (a) Prove that –

$$\frac{d}{dx} \left[J_n^2 + J_{n+1}^2 \right] = \frac{2}{x} \left[n J_n^2 - (n+1) J_{n+1}^2 \right]$$

- (b) Prove that –

$$z J_n'(z) = z J_{n-1}(z) - n J_n(z)$$

UNIT - IV

- Q.4. (a) State and prove generating function for Hermite's polynomial.
(b) Establish the Hermite's differential equation.

UNIT - V

- Q.5. (a) Prove that –

$$L_n(x) = \frac{e^x}{n!} D^n (x^n e^{-x})$$

- (b) Prove that –

$$x L_n'(x) = n (L_n(x) - L_{n-1}(x))$$

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Code No. : OBS/405/M/20

M.Sc. IV SEMESTER ATKT EXAMINATION SEPT. - 2020

Subject : Mathematics
Paper – V
Integral Transform

Max. Marks : 35

- Note : 1. Attempt all questions.
2. All questions carry equal marks.

Q.1. An inductor of 3 henrys is in series with a resistance of 30 ohms and an e.m.f. of 150 volts Assuming that at $t=0$ the current is zero, find the current at time $t > 0$.

Q.2. A beam which is clamped at its ends $x = 0$, $x = l$ carries a uniform load ω_0 per unit length, show that the deflection at any point is

$$y(x) = \frac{\omega_0 x^2 (1-x)^2}{24 EI}$$

Q.3. State and prove convolution theorem.

Q.4. Write and solve Parseval's identify of fourier series.

Q.5. Find the finite Fourier cosine transform of $f(x)$ where –

$$f(x) = \begin{cases} 1 & \text{for } 0 \leq x \leq \frac{\pi}{2} \\ -1 & \text{for } \frac{\pi}{2} < x < \pi \end{cases}$$

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