

**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.- BOTANY**

Time: 4 Hours

**PAPER : 103**

Full Marks: 60

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

1. **Answer any SIX of the following.** [2 x 6]

- i) Differentiate protein domain and motif.
- ii) Define tertiary structure of proteins.
- iii) How are nonreducing disaccharides formed? Give one example.
- iv) What is substrate level phosphorylation? Where does it occur in glycolysis ?
- v) What are lyases? Give one example.
- vi) What is noncompetitive inhibition?
- vii) How are sphingolipids composed?
- viii) Where does the  $\beta$ -oxidate of fatty acids take place in the cell?

**Answer Any FOUR questions.** [12 x 4]

2. Give an account of amino acid catabolism.
3. Classify amino acids on the basis of amino acid side chains and show chemical composition of each.
4. Describe electron transport system and ATP synthesis in mitochondria.

[2 ]

5. Give an account of the mode and mechanism of enzyme action. Write the properties of enzymes.
6. Describe the regulation of fatty acid metabolism.
7. Write notes on:
  - a) Glycogen catabolism
  - b) Nomenclature of enzyme
8. Write note on:
  - a) Storage lipids
  - b) Monosaccharides.



**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.- ENGLISH**

Time: 4 Hours

**PAPER : 103**

Full Marks: 80

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**Group - A**

[2 x8

1. **Answer any EIGHT of the following.**
- Why is Measure for Measure regarded as a problem play?
  - Explain, “motiveless malignity” of Iago.
  - What is the role of Caliban in The Tempest?
  - Who is Isabella in Measure for Measure?
  - Who is Cassio?
  - Write a note on Gavestone.
  - Briefly introduce Angelo.
  - What do you understand by Hamartia?
  - Write a note on Prospero.
  - Who is at the root of Desdemona’s suffering?

**Group - B**

[16 x 4

**Answer Any FOUR questions.**

2. a) Discuss 'Othello' as a domestic tragedy fuelled by intrigue and jealousy.
- b) Do you consider 'The Tempest' to be a tragic-comedy? Give reasons.
- c) Sketch the character of Iago.
- d) There is a dichotomy between corruption and purity in the play Measure for Measure. Elaborate.
- e) Discuss Marlowe's Edward II as a worthy predecessor of Shakespeare's historic plays.
- f) Discuss Marlowe's contribution to Elizabethan Drama with reference to Edward II.



**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019****Sub.- CHEMISTRY**

Time: 4 Hours

**PAPER : 103**

Full Marks: 60

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**Group - A**

[6 x 2]

1. Answer any SIX of the following.

- Find the value of the commutator  $[x, d/dx]$
- Write the Hamiltonian for Helium atom in atomic unit.
- What is variation theorem?
- Find the degeneracy of energy level with energy equal to  $14(h^2/8ma^2)$
- What is spin orbit coupling?
- Why the term symbol  $^4S_1$  and  $^2D_{7/2}$  are erroneous.
- What are the drawbacks of valence bond theory?
- Draw the molecular orbital diagram for  $O_2$  molecule.

**Group - B**

Answer Any FOUR questions.

[8+4]

2. a) State the postulates of Quantum Mechanics.
- b) Show that  $\psi_1 = (1/2\pi)^{1/2}$  and  $\psi_2 = (1/2\pi)^{1/2} \cos x$  is normalised.

3. Discuss the solution of Schrodinger wave equation for a particle in three dimensional cubic box of edge length 'a' assuing that the potential energy is zero within the box and indifinity outside the box. [12]
4. Using the variation method solve the Schrodinger wave equation for the ground state energy of Helium atom. [12]
5. Solve the Schrodinger wave equation for the ground state energy of Helium atom using the perturbation theory. [12]
6. a) Draw the vector diagram to show the possible terms for two non equivalent p-electron i.e.  $np^1 n'p^1$ . [6+6]  
b) Find the possible terms for  $p^2$ -configuration.
7. Write notes on  
a) Zeeman Splitting [6+6]  
b) Russel-Saunders Coupling
8. Discuss the Valence bond theory for Hydrogen molecule. [12]
9. Using the Huckels molecule orbital theory find the  $\pi$ -MOs, Bond order and electron density of Butadiene. [12]



**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.- HINDI**  
**PAPER : 103**

Time: 4 Hours  
Full Marks: 80

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**GROUP- A**

[2x8]

1. निम्नलिखित किन्हीं आठ प्रश्नों के संक्षिप्त उत्तर दीजिए।
  - क) काव्य का एक लक्षण लिखिए।
  - ख) काव्य के प्रमुख हेतुओं के नाम लिखिए।
  - ग) 'भरत मुनि' के ग्रंथ का नाम क्या है?
  - घ) 'साध्यारीकरण' किसे कहते हैं?
  - ङ) किस रस का अन्य नाम 'रसराज' है?
  - च) अलंकार की एक परिभाषा लिखिए।
  - छ) अलंकार सम्प्रदाय के प्रमुख दो आचार्यों के नाम लिखिए।
  - ज) वैदर्भी रीति किसे कहते हैं?
  - झ) काव्य में गुण का अभाव क्या कहलाता है?
  - ञ) वक्रोक्ति सम्प्रदाय के संस्थापक कौन हैं?

## GROUP - B

( निम्नलिखित किन्हीं चार प्रश्नों के उत्तर दीजिए )

[16x4]

2. भारतीय विद्वानों द्वारा दी गई काव्य की परिभाषा लिखिए।
3. भारतीय काव्य-शास्त्र की दृष्टि से काव्य के विभिन्न प्रयोजनों पर प्रकाश डालिए।
4. रस किसे कहते हैं? रस के विभिन्न अंगों का संक्षिप्त परिचय दीजिए।
5. अलंकार के प्रमुख भेदों की विवेचना कीजिए।
6. रीति किसे कहते हैं? रीति की अवधारणा स्पष्ट कीजिए।
7. व्यंजना और लक्षणा शब्द शक्ति के प्रमुख अंतरों की आलोचना कीजिए।
7. वक्रोक्ति सिद्धांत की मूल संस्थापनाओं पर प्रकाश डालिए।





**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.-ZOOLOGY**

Time: 4 Hours

**PAPER : P-103**

Full Marks: 60

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**Group - A**

[6 x 2

1. **Answer any SIX of the following.**

- a) Justify amino acids as zwitter ions.
- b) What do you mean by motifs and domains?
- c) What is an optical isomer?
- d) What is the importance of oxygen in electron transport chain?
- e) Write the formula for  $V_{max}$  and  $\frac{1}{2} v_{max}$
- f) What is allosteric regulation of enzymes?
- g) What is terpenes?
- h) Differentiate between saturated and unsaturated fatty acids with examples.

[2]

## **Group - B**

[16x 4

**Answer Any FOUR questions.**

2. Give an account of catabolism of amino acids.
3. Describe the steps of pentose phosphate pathway along with its significance.
4. Explain the nomenclature and classification of enzymes with examples.
5. Describe the process of biosynthesis of fatty acids.
6. Give an account of the mechanism of action of RNASE.
7. How can the carbohydrate metabolism be regulated.
8. Write notes on:
  - a) Bio-logically active peptides.
  - b) Lipids as signalling molecules.



**PG, 1<sup>ST</sup> SEMESTER EXAMINATION-2019**

**Sub: PSYCHOLOGY**

Full Marks: 60

**Paper: 103**

Time: 4 Hours

*Answer the questions as per instruction.*

*The figure in the right hand margin indicate marks.*

*Question No. 1 is mandatory.*

**GROUP-A**

[2x6]

**1. Answer any SIX questions given below.**

- (a) Goals of social psychology
- (b) Social psychology and sociology
- (c) Correspondence bias
- (d) Self-serving bias
- (e) Persuasion and social change
- (f) Compliance
- (g) Give an example of prejudice
- (h) Prejudice and discrimination

**GROUP-B**

[12x4]

**Answer any FOUR questions.**

- 2. Define social psychology. Discuss the nature and scope of social psychology.
- 3. What is attribution? Explain Kelley's covariation model of attribution.
- 4. Narrate the factors which influence pro-social behaviour among people.
- 5. Substantiate different methods to change others behaviour.

[2]

6. What is prejudice? Discuss its nature and meaning.
7. Describe the major sources of prejudice.
8. Highlight different means of reducing prejudice.

- x - x - x -

PG, 1<sup>ST</sup> SEMESTER EXAMINATION-2019

Sub: ODI A

Full Marks: 80

Paper: 103

Time: 4 Hours

*Answer the questions as per instruction.**The figure in the right hand margin indicate marks.**Question No. 1 is mandatory.*

କ-ବିଭାଗ

[2x8]

୧. ଯେକୌଣସି ୮ଟିର ସଂକ୍ଷିପ୍ତ ଚିତ୍ରପଟଣା ଦିଅ ।

- (କ) ମିଶ୍‌ନାରୀ ଓଡ଼ିଆ ପତ୍ରପତ୍ରିକା
- (ଖ) କାନ୍ତିଚନ୍ଦ୍ର ଭଟ୍ଟାଚାର୍ଯ୍ୟ
- (ଗ) ଫକୀର ମୋହନଙ୍କ ଦ୍ୱାରା ରଚିତ ପାଠ୍ୟପୁସ୍ତକ
- (ଘ) 'ଲକ୍ଷ୍ମୀ' ଉପନ୍ୟାସର ଐତିହାସିକ ପୃଷ୍ଠଭୂମି
- (ଙ) ବସନ୍ତଗାଥା
- (ଚ) ସତ୍ୟବାଦୀ ବନବିଦ୍ୟାଳୟ
- (ଛ) ବହୁମୁଖୀ ପ୍ରତିଭା ପଣ୍ଡିତ ଗୋଦାବରୀଶ ମିଶ୍ର
- (ଜ) 'ସୁଗବାଣୀ' ପତ୍ରିକା
- (ଝ) ଭଗବତୀ ଚରଣ ପାଣିଗ୍ରାହୀଙ୍କ କ୍ଷୁଦ୍ରଗଳ୍ପ
- (ଞ) 'ରକ୍ତଶିଖା' କବିତା ସଂକଳନ

ଖ-ବିଭାଗ

(ଦୀର୍ଘଉତ୍ତର ମୂଳକ ପ୍ରଶ୍ନ)

[16x4]

୨. ଆଧୁନିକ ଓଡ଼ିଆ ସାହିତ୍ୟର ପୃଷ୍ଠଭୂମି ସମ୍ପର୍କରେ ଆଲୋଚନା କର ।

ଅଥବା

ଓଡ଼ିଆ ସାହିତ୍ୟରେ ଆଧୁନିକତା ଆଗମନରେ ଇଂରାଜୀ ଶିକ୍ଷାର ଭୂମିକା  
ଆକଳନ କର ।

(P.T.O...)

[2]

୩. ରାଧାନାଥ ରାୟଙ୍କୁ ଯୁଗ ପ୍ରବର୍ତ୍ତକ ସ୍ତମ୍ଭା କହିବାର ତାତ୍ପର୍ଯ୍ୟ ବୁଝାଇ ଦିଅ ।

ଅଥବା

ପ୍ରାଚ୍ୟ ଆଦର୍ଶର ଆଧୁନିକ ଉଦ୍‌ଘୋଷକ ହେଉଛନ୍ତି କବି ଗଙ୍ଗାଧର ମେହେର - ଏ ଉକ୍ତିର ଯଥାର୍ଥତା ପ୍ରତିପାଦନ କର ।

୪. ସତ୍ୟବାଦୀ ସାହିତ୍ୟରେ ପ୍ରତିଫଳିତ ଜାତୀୟତାବାଦର ସ୍ୱରୂପ ବର୍ଣ୍ଣନା କର ।

ଅଥବା

ସବୁଜ ସାହିତ୍ୟର ବିଶେଷତ୍ୱ ବିଶ୍ଳେଷଣ କର ।

୫. ପ୍ରଗତିବାଦୀ ସାହିତ୍ୟର ପ୍ରମୁଖ କବିମାନଙ୍କର ପରିଚୟ ପ୍ରଦାନ କର ।

ଅଥବା

ଅନନ୍ତ ପଟ୍ଟନାୟକଙ୍କ ରଚନାବଳୀରେ ପ୍ରତିଫଳିତ ସାମ୍ୟବାଦୀ ଚେତନାର ବ୍ୟାଖ୍ୟା କର ।

- x - x - x -

**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.- SOCIOLOGY**

Time: 4 Hours

**PAPER : 103**

Full Marks: 80

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**Group - A**

[2 x8

1. **Answer any EIGHT of the following.**

- a) What do you mean by village community?
- b) Define Caste.
- c) What is Jajmani system?
- d) Write any two characteristics of agrarian society.
- e) Mention the aims of Community Development programme.
- f) Write features of Green Revolution.
- g) What is Rural Factionalism?
- h) Find out any two causes of Naxalbari Peasant Movements?
- i) Write any two differences between Rural Society and Urban Society.
- j) Mention any two causes of Rural poverty.

[2]

**Group -B**

[16 x 4

**Answer Any FOUR questions.**

2. Analyse the meaning and subject matter of Rural Sociology.
3. Define village community and discuss its characteristics.
4. Explain various theories responsible for the origin of caste.
5. Analyse the impact of Globalisation on agriculture in India.
6. Write an essay on Green Revolution in India.
7. Critically examine peasant movements in pre-independent and post-independent period.
8. Discuss the causes and consequences of Rural poverty.





**PG, 1<sup>ST</sup> SEMESTER EXAMINATION-2019**

**Sub: COMMERCE**

Full Marks: 80

**Paper: 103**

Time: 4 Hours

*Answer the questions as per instruction.*

*The figure in the right hand margin indicate marks.*

*Question No. 1 is mandatory.*

**1. Answer any EIGHT questions given below.**

[2x8]

- (a) State various managerial skills.
- (b) Define functional foremanship.
- (c) What is division of work?
- (d) What is the principle of 'Espirit De Corps'?
- (e) Define contingency planning.
- (f) What do you mean by Demand forecasting?
- (g) What is informal organisation?
- (h) Define organisational Hierarchy?
- (i) What is Delegation of Authority?
- (j) What do you mean by 360<sup>0</sup> performance Appraisal method?
- (k) What are different methods of Recruitment?
- (l) Define Job description.

**Answer any FOUR questions.**

[16x4]

2. Explain Max Weber's contribution to classical Management thought.
3. Discuss the role of planning in a modern business organisation & explain various planning premises.
4. "Managers can not be rational decision makers in real life"- Discuss and state various techniques of decision making.

(P.T.O...)

[2]

5. Define organisation structure and state the factors that affect organisation structure.
6. A matrix organisation is a hybrid organisation structure of the mix of functional & project structure- comment.
7. Define manpower planning. Out line the steps involved in Manpower planning process.
8. (a) Differentiate between Training & Development  
(b) Enumerate the steps involved in succession planning.

- x - x - x -

**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.- POLITICAL SCIENCE**

Time: 4 Hours

**PAPER : 103**

Full Marks: 80

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**Group - A**

[8 x 2

1. **Answer any SIX of the following.**

- a) Is one religion suitable for India?
- b) Tribes are fighting to preserve their culture.  
Comment.
- c) President of India is a nominal head. Explain.
- d) Is it a Prime-minister form of Government in India?
- e) What is vote-on-account?
- f) Should Hindi be imposed as the official language in India?
- g) What is cooperative federation?
- h) What do you mean by political culture?
- i) Why Communist party is fading away in India?
- j) What is Judicial Review?

**Group - B**

[16 x 4

**Answer Any FOUR questions.**

2. Critically examine how religion is responsible to divide the social infrastructure of the Indian polity.
3. What are the recent emerging trends of political culture in India?
4. The democratic principle of 'From the bottom up' was substituted by the fascist principle of 'from top down'.
5. India can no longer be correctly described as a one-party state, but there is still some truth in such a characterisation so far as the national scene is concerned'. Examine.
6. Do you agree that the role of regional political parties have been marginalised in national politics?
7. "Indian President is an independent institution with independent authority and independent functions." Explain.
8. 'Parliament has become either like an ornament institution or virtually redundant.'" - Comment.
9. What do you suggest to improve the voting behaviour of people in Indian election?



**PG, 1<sup>ST</sup> SEMESTER EXAMINATION-2019**

**Sub: HISTORY**

Full Marks: 80

**Paper: 103**

Time: 4 Hours

*Answer the questions as per instruction.  
The figure in the right hand margin indicate marks.  
Question No. 1 is mandatory.*

**1. Answer any EIGHT questions given below.** [2x8]

- (a) Who was the President of America during the First World War?
- (b) In which year Locarno Pact was signed?
- (c) In which year Germany was admitted to the League of Nations?
- (d) What is name of Russian Parliament?
- (e) What was the symbol of the Nazis?
- (f) Who established Fascist Party?
- (g) Who was the founder of the Hoa Hao Movement?
- (h) In which year Wafd party established in Egypt?
- (i) When did Balfour Declaration issued?
- (j) When did Japan attack Pearl Harbor?
- (k) Who was writer of Mein Kampf?
- (l) When did Molotov-Ribbentrop pact signed?

**Answer any FOUR questions.** [16x4]

2. What were important provisions of the Treaty of Versailles? Critically discuss its impact on Germany.
3. Critically evaluate the achievements and failures of the League of Nations.
4. What was New Deal? Examine its merits and demerits?

5. Discuss the causes and significance of the Russian Revolution, 1917.
6. Analyse the factors leading to the rise of Nationalism in Indo-China.
7. Discuss the important features of the foreign policy of the U.K. between two World Wars.
8. What do you mean by Disarmament? Discuss the achievements and failures of Disarmament Conferences between two World Wars.
9. Examine the causes and consequences of the second World War.

[4]

- b) Find the solution of one-dimensional heat equation. [6]
8. Write short notes on any TWO. [6+6]
- a) Gronwal inequality and applications
- b) Quasi - linearization method
- c) Bessel's equation and applications.
- d) Dirichlet's problem for a ball.



No. of Pages: 4

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**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

**Sub.- Mathematics** (Advance Differential Equation)

Time: 3 Hours

Full Marks: 60

**PAPER : P-103**

*The figure in the right hand margin indicate marks.  
Question No.1 is compulsory, answer any FOUR from the rest.*

1. Answer any SIX of the following. [6 x 2]
- a) State Lipschitz condition for existence of unique solution of differential equation
- b) Write down the integral equation corresponding to the initial value problem  $y' = xy$ ,  $y(0) = 1$
- c) Solve  $(y+1)\frac{dy}{dx} + x(y^2 + 2y) = x$
- d) If  $y_1 = x^2 e^x$  &  $y_2 = x e^{2x}$  then find w ( $y_1, y_2$ )
- e) Find the Green's function for  $y'' + 9y = 0$ ,  $y(0) = 1$ ,  $y'(0) = -1$
- f) State Laplace equation in cylindrical coordinates.
- g) State the solution of one-dimensional wave equation by D-Alembert's method.

[2]

h) Solve the p.d.e. using separation of variable

$$\frac{\partial u}{\partial x} = 9 \frac{\partial u}{\partial t}$$

**Answer any FOUR questions.**

2. a) Prove that the function

$$\phi_n(x) = y_0 + \int_{x_0}^x f(s, \phi_{n-1}(s)) ds \quad \text{exist and}$$

continuous on the interval  $I: |x - x_0| \leq h$  andsatisfy  $|\phi_n(x) - y_0| \leq M |x - x_0|$ for all  $x$  in  $I$ ,  $n = 1, 2, 3, \dots$ 

b) Construct Picard's successive approximation for the initial value problem.

$$y' = y, y(0) = 1, x \geq 0$$

3. a) Solve the system of differential equations

$$\frac{d^2 x}{dt^2} - 3x - 4y = 0, \quad \frac{d^2 y}{dt^2} + x + y = 0$$

b) Solve the initial value problem

$$\underline{x} = \begin{pmatrix} 1 & 1 \\ 4 & 1 \end{pmatrix} \underline{x}, \quad \underline{x}(0) = \begin{pmatrix} 2 \\ 3 \end{pmatrix}$$

4. a) Find the eigen values and eigen function of the Sturm - Liouville problem

$$\frac{d}{dx} \left[ x \frac{dy}{dx} \right] + \frac{\lambda}{x} y = 0, \quad y(1) = 0, \quad y(e^\pi) = 0$$

[3]

b) Solve the following boundary value problem using approximate Green's function

$$y'' = 1 - y, \quad y(0) = 0, \quad y'(1) = 0$$

5. a) Solve the following Boundary value problem

$$y'' - y = f(x), \quad y(0) = y(1) = 0$$

b) Prove that the Legendre's differential equation

$$(1 - x^2)y'' - 2xy' + n(n+1)y = 0$$

is self-adjoint.

6. a) Transform Laplace equation in cartesian co-ordinate for 2 - variable to polar form.

b) Find the solution of

$$\frac{\partial^2 u}{\partial x_1^2} + \frac{\partial^2 u}{\partial x_2^2} + \frac{\partial^2 u}{\partial x_3^2} - \frac{\partial^2 u}{\partial t^2} = 0$$

7. a) Find the solution of the wave equation

$$\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2} \quad \text{corresponding to the triangular}$$

initial deflection  $f(x) = \frac{2k}{l} x$ ,for  $0 < x < \frac{l}{2}$ 

$$= \frac{2k}{l} (l - x), \quad \text{for } \frac{l}{2} < x < l$$



**PG, 1<sup>ST</sup> SEMESTER EXAMINATION-2019****Sub: ECONOMICS**

Full Marks: 80

**Paper: 103**

Time: 4 Hours

*Answer the questions as per instruction.**The figure in the right hand margin indicate marks.**Question No. 1 is mandatory.***1. Answer any EIGHT questions given below.****[2x8]**

- (a) If demand equation of Curd is  $P = 6 - \frac{1}{2}x$  rupees. Find the level of production that results in maximum revenue.
- (b) Calculate marginal cost for  
 $C = (10^{-6})x^3 - 0.003x^2 + 5x + 1000$ .
- (c) Point out the limitation of 1/0 model.
- (d) Differentiate between feasible, basic and basic feasible solution.
- (e) What are the conditions for maximising or minimising any function?
- (f) Solve by Cramer's rule.  
 $3x - y = 2$   
 $x + 4y = 5$
- (g) Name the only person to win both Nobel Memorial prize in economic science and Abel prize. Also mention his/her contribution.
- (h) Give any two economic application of LPP.
- (i) Differentiate between matrix and determinant.
- (j) What is Euler's theorem?

[2]

**Answer any FOUR questions.**

2. If for a monopolist  $P = (100 - 0.01x)$  and  $C = (50x + 10000)$ . Find the value of  $x$  that maximises the profit and determine the corresponding price and total profit. What will happen if the government imposes a tax of Rs 10 per unit. [16]

3. (a) Find the Inverse of  $A = \begin{pmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{pmatrix}$ . [5]

(b) Prove  $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$ . [6]

(c) Differentiate between open and closed input output model. [5]

4. (a) Given  $U = q_1 q_2$  and the budget constraint  $2q_1 + 5q_2 = 100$ . Obtain optimum purchase of  $q_1$  and  $q_2$  to maximise utility. [8]

(b) For  $P = 100 - 4x$  and  $C = 50x + 20x$ . Find the price and output that maximises monopoly profit. [8]

5. Solve by simplex method [16]  
 $\max z = 30x_1 + 24x_2 + 60x_3$   
 sub to :  $6x_1 + 3x_2 + 5x_3 \leq 30$   
 $2x_1 + 2x_2 + 10x_3 \leq 50$   
 and  $x_1, x_2, x_3 \geq 0$

6. (a) What is prisoner's dilemma. [8]

(b) Determine consumer's and producer's surplus under [8]

pure competition for  $P^d = \left(\frac{8}{x+1}\right) - 2; P^s = \left(\frac{x+3}{2}\right)$ .

[3]

7. (a) If  $Y = C + S$ , then find values of  $Y, C, S$  for  $C = 100 - 0.5y$  and  $S = 50 + 0.35y$ . [8]

(b) Find the price of  $X$  and  $Y$  for Ananya who earns Rs. 1200 and is indifferent between [8]

(i) 10 units of  $X$ , 20 units of  $Y$ .

(ii) 15 units of  $X$ , 10 units of  $Y$ .

8. Show that  $Y = \frac{x^2 - 1}{x - 1}$  is continuous except at  $x = 1$ . What [16]

is the nature of discontinuity at this point? Show that when  $Y = 2$  and  $X = 1$  the function is completely continuous

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**GACR**  
**PG 1<sup>st</sup> Semester End Examination-2019**  
**(SCIENCE)**

SUBJECT : PHYSICS

Full marks - 60

PAPER : 103

Time: 4 Hours

The figures in the right hand margin indicate marks  
Question No 1 is compulsory, answer any FOUR from the rest

(1) Answer any SIX of the following questions [2×6]

(a) Show that if  $\hat{A}$  is hermitian,  $\hat{Q} = \frac{1+i\hat{A}}{1-i\hat{A}}$  is unitary.

(b) If  $|\psi\rangle = \sum_n C_n |\psi_n\rangle$ , find the norm of  $|\psi\rangle$

(c) Show that  $|u\rangle\langle v|$  is a linear operator.

(d) Explain what is meant by an observable.

(e) Using the matrix representation of spin operators, show that

$$[\hat{S}_x, \hat{S}_y] = i\hbar\hat{S}_z$$

(f) Prove that  $Tr\hat{A}\hat{B} = Tr\hat{B}\hat{A}$

(h) Write a notes on energy eigenket

(2) (a) Find eigenvalues and normalised eigenvectors of the matrix

$$A = \begin{pmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{pmatrix} \quad [6]$$

(b) Prove the triangle inequality  $\sqrt{\langle u+v|u+v\rangle} \leq \sqrt{\langle u|u\rangle} + \sqrt{\langle v|v\rangle}$  where  $|u\rangle$  and  $|v\rangle$  are the ket vectors. [6]

(3) (a) How does the interaction picture differ from the Schrödinger picture and the Heisenberg picture? Obtain the equation of motion for operators and state vectors in the interaction picture. [8]

(b) Prove that eigenvalues of Hermitian operators are real. [4]

- (4) Express the Hamiltonian of a 1-d harmonic oscillator of mass  $m$  and angular frequency  $\omega$  in terms of raising operator  $a^\dagger$  and lowering operator  $a$ . Obtain the energy eigenvalues and the ground state wave function,  $\psi_0(x)$ , in the coordinate representation, for the oscillator. Calculate the expectation value of  $p^2$ ,  $\langle n|p^2|n\rangle$ , where  $|n\rangle$  is the eigenstate and  $p$  is the momentum operator. [12]
- (5) Calculate Clebsch-Gordan coefficients for  $j_1 = 1/2$  and  $j_2 = 1/2$  and find the transformation matrix which is formed by the Clebsch-Gordan coefficients. [12]
- (6) (a) An electron is in the spin state  $|\chi\rangle = \frac{|\uparrow\rangle + |\downarrow\rangle}{\sqrt{2}}$  where  $|\uparrow\rangle = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$  and  $|\downarrow\rangle = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ . Find the expectation value of  $\hat{A} = i\hat{S}_x\hat{S}_y\hat{S}_z$  in this state. [6]  
 (b) A particle is in the state  $\psi = \frac{1}{\sqrt{5}}Y_{1,-1} + \frac{3}{\sqrt{5}}Y_{1,0} + \frac{1}{\sqrt{5}}Y_{1,1}$ . Find  $\langle L_+ \rangle$  in the state. [6]
- (7) Starting from the radial equation of the hydrogen atom, obtain the energy eigenvalues. Find  $\langle r^2 \rangle$  for an electron in the  $n$ -th state of H-atom. [12]
- (8) (a) Prove  $[\hat{L}^2, \vec{r}] = 2\hbar^2 \vec{r} + 2i\hbar (\vec{r} \times \vec{L})$ . [6]  
 (b) Find the expectation value of the potential energy of the electron in the ground state of hydrogen atom. [6]

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QUESTION FOR PG , 1<sup>st</sup> SEMESTER EXAMINATION 2019(ARTS/SCIENCE/COMMERCE/SF)

## GACR

### INSTRUCTION TO THE CANDIDATE

(STRIKE OFF THE APPLICATION)

M.A IN EDUCATION

SUBJECT: STATISTICS IN EDUCATION

FULL MARKS: 60

PAPER: 103

SEMESTER-I

TIME: 3 Hours

1. All questions carry equal marks
2. Marks have been mentioned in the right hand corner
- 3.(a) Question No-1 is mandatory having ten bit questions to answer eight bits among them.  
(b) Q No-2 to Q.No-7 has subjective and candidate to answer four among them.  
(In case of practical subject candidate has to answer 6 bit questions for Q No-1 i.e  $6 \times 2 = 12$  and other long questions are 12 marks each)

Q1. Answer the following questions (any six)

- (a) Establish the relationship among A.M,G,M and H.M
- (b) What is mode?Give a practical example.
- (c) What is Ordinal Scale ?Give an Example.
- (d) What are various relative measures of Skewness?
- (e) Define statistic and parameter
- (f) What is sampling error?
- (g) Define Null and Alternative Hypothesis.
- (h) Define T score.

Q2. (a) What are averages ?Define its objectives. What are the essentials of a good averages [12]

(b) Find mode of the following data:

X:	0-10	10-20	20-30	30-40	40-50	50-60	60-7
F:	12	18	37	40	43	15	11

Q3. (a) What is Correlation?Explain its types,properties and uses. [12]

(b) Find rank correlation from the following data:

Marks of Education:	70	80	45	60	68	56	50
Marks of Statistics:	65	68	70	72	65	60	55



**PG 1<sup>st</sup> SEMESTER EXAMINATION-2019**

Sub.- Operating System

Time: 4 Hours

PAPER : MCS-103

Full Marks: 80

*The figure in the right hand margin indicate marks.*

*Question No.1 is compulsory, answer any FOUR from the rest.*

**GROUP -A**

[2 x 8

1. Answer any EIGHT questions of the following
  - a) Mention any two goals of an operating system.
  - b) How multiprogramming is different from uniprogramming.
  - c) Specify two characteristics as real time systems.
  - d) Why page size is usually power of 2?
  - e) How logical address is different from physical address.
  - f) Is it possible to have a deadlock with just one process. Justify your answer.
  - g) Why thread is called a light weight process?
  - h) Define critical section.
  - i) Why does page fault occur?
  - j) Give real life examples that represent deadlock situation.

**GROUP-B**

[16x4]

**Answer Any FOUR questions.**

2. a) Discuss major services of an operating system. [8]  
 b) What is a real time system. Discuss types of real time system with examples. [8]
3. a) How a process is different from program. Draw a neat diagram to explain various states of process as well as transitions among states. [8]  
 b) Discuss various operations on process. [8]
4. a) What is segmentation? How logical address is converted to a physical address in segmentation. [8]  
 b) What is paging? Discuss steps taken by the operating system in case of page fault. [8]
5. a) Write down a solution to producer consumer problem. [8]  
 b) Write down necessary conditions for deadlock. Give an example of deadlock involving three process [8]
6. a) How to detect a dead lock? Discuss methods of recover from deadlock. [8]  
 b) Write down Barker's algorithm. [8]
7. a) Consider the following set of process with the length of the CPU-burst time given in milliseconds. [8]

Process	Burst time
P1	10
P2	3
P3	2
P4	1
P5	5

The processes are assumed to have arrived in the order P1, P2, P3, P4, P5 all at time 0.

- a) Draw Gantt chart for FCFS algorithm.  
 b) Draw Gantt chart for SJF algorithm.
- b) Explain the need of page replacement with an example page reference string: for FIFO page replacement algorithm. [8]
8. Answer any FOUR. (Short note)
- a) Inter process communication  
 b) Semaphore [16  
 c) Virtual memory  
 d) Thread  
 e) Batch Operating system.





The figures in the right hand margin indicate marks.

## Group- A

1. Answer any **SIX** questions: $2 \times 6 = 12$ 

- i) For what conditions a nonempty collection  $\mathcal{F}$  of subsets of  $\Omega$  is called a field.  
 ii) For what conditions a nonempty collection  $\mathcal{F}$  of subsets of  $\Omega$  is called a monotone class.  
 iii) Let  $X$  and  $Y$  be continuous random variables with joint .p. d. f.

$$f(x, y) = \begin{cases} 12x, & \text{for } 0 < y < 2x < 1 \\ 0, & \text{otherwise} \end{cases}. \text{What is the conditional density function of } Y \text{ given}$$

$$X = x ?$$

- iv) If the density function of  $X$  is  $f(x) = \begin{cases} \frac{1}{2}, & \text{for } -1 < x < 1 \\ 0, & \text{otherwise} \end{cases}$ , what is the probability density

$$\text{function of } Y = X^2 ?$$

- v) Define conditional variance of  $Y$  given  $X = x$ ?  
 vi) Let  $X$  and  $Y$  be discrete random variables with joint probability density function

$$f(x, y) = \begin{cases} \frac{1}{2^{1(x+y)}}, & \text{for } x = 1, 2, 3; y = 1, 2 \\ 0, & \text{otherwise} \end{cases}. \text{What is the } E(X|y)?$$

- vii) Let  $X_1$  and  $X_2$  be two independent Poisson variates with parameters  $\lambda_1$  and  $\lambda_2$ , then what is the distribution of  $X_1$  given  $X_1 + X_2$  ?  
 viii) What is the expected number of throws necessary in repeatedly casting a die until an ace turns up?  
 ix) Write the p. d. f. of a Beta distribution of second kind.  
 x) If  $X_1, X_2, \dots, X_8$  are  $n$  independently and identically distributed random variables each having  $N(\mu, 1)$  distribution, then what will be the p. d. f. of  $8^{-1}S_8$  where  $S_8 = \sum_{i=1}^8 X_i$

## Group- B

Answer any **FOUR** questions: $12 \times 4 = 48$ 

2. a) A field is a Borel field if and only if it is also an Monotone class. Prove it.  
 b) Let  $\mathcal{F}_0$  be a field,  $\mathcal{G}$  the minimal monotonic class containing  $\mathcal{F}_0$  and  $\mathcal{F}$  the minimal Borel field containing  $\mathcal{F}_0$ , then show that  $\mathcal{F} = \mathcal{G}$ .
3. a) The axioms of finite additivity and continuity together are equivalent to the axioms of countable additivity.  
 b) If  $\{X_j, 1 \leq j \leq n\}$  are independent random variables  $\{f_j, 1 \leq j \leq n\}$  are Borel measurable functions then  $\{f_j(X_j), 1 \leq j \leq n\}$  are independent random variables. Prove it.
4. a) The variance of  $X$  can be regarded as consisting of two parts, the expectation of the conditional

variance and the variance of the conditional expectation. Prove it.

b) The probability density function of the random variable  $X$  follows the probability law:

$$f(x) = \frac{1}{2\theta} \exp\left(-\frac{|x-\theta|}{\theta}\right), -\infty < x < \infty. \text{ Find moment generating function of } X.$$

5. a) State and prove Markov's Inequality.

b) Let  $X_{(1)}, X_{(2)}, X_{(3)}, \dots, X_{(n)}$  be the set of order statistics of independent RVs  $X_1, X_2, X_3, \dots, X_n$  with

$$\text{common df } f(x) = \begin{cases} \beta \exp(-x\beta), & \text{if } x \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

Show that  $X_{(r)}$  and  $X_{(s)} - X_{(r)}$  are independent for any  $s > r$ .

6. a) Show that  $E(Y - \phi(X))^2$  is minimized by choosing  $\phi(X) = E(Y/X)$ .

b) The number of female insects in a given region follows a Poisson distribution with mean  $\lambda$ . The number of eggs laid by each insect is a Poisson RV. Find the probability distribution of the number of eggs in the region.

7. a) Define Gamma distribution with parameters  $\alpha$  and  $\beta$ . Write its distribution function and obtain moment generating function. Hence Find mean and its variance.

b) Let the probability density function of a random variable  $X$  be

$$f(x, y) = \begin{cases} 630x^4(1-x^4), & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}. \text{ What is the exact value of } P(|X - \mu| \leq 2\sigma)?$$

What is the approximate value of  $P(|X - \mu| \leq 2\sigma)$  when one uses the Chebychev inequality?

8. a) If  $X \sim N(\mu, \sigma^2)$  then show that mean is  $\mu$  and variance is  $\sigma^2$  and moment generating function is

$$e^{\mu t + \frac{t^2 \sigma^2}{2}}.$$

b) Let  $X$  and  $Y$  be independent  $G(\alpha_1, \beta)$  and  $G(\alpha_2, \beta)$ , respectively RVs. Then prove that  $X/(X + Y)$  is a  $B(\alpha_1, \alpha_2)$  RV.