

This question paper contains 28 printed pages.

Your Roll No.

Sl. No. of Ques. Paper : 3136 IC
Unique Paper Code : 22411201
Name of Paper : Corporate Accounting
Name of Course : B.Com. (Hons.)
Semester : II
Duration : 3 hours
Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

*(इस प्रश्न-पत्र के मिलते ही ऊपर दिये गये निर्धारित
स्थान पर अपना अनुक्रमांक लिखिये।)*

NOTE :- *Answers may be written either in English or in Hindi;
but the same medium should be used throughout
the paper.*

टिप्पणी : *इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिन्दी किसी एक भाषा
में दीजिये; लेकिन सभी उत्तरों का माध्यम एक ही होना
चाहिए।*

Attempt all questions.

Show your working notes clearly.

All questions carry equal marks.

सभी प्रश्नों के उत्तर दीजिए।

अपने कार्यचालन नोट स्पष्टतया दिखाएँ।

सभी प्रश्नों के अंक समान हैं।

P.T.O.

1. (a) Write a short note on book building process.

पुस्तक बनाने (बुक बिल्डिंग) की प्रक्रिया पर संक्षिप्त टिप्पणी लिखिये। 5

- (b) Following is the balance sheet of Pragati Limited as at 31st March, 2017 :

31-3-2017 का प्रगति लि० का तुलन पत्र निम्न है :

Particulars	Note No.	Rs.
I. EQUITY AND LIABILITIES		
1. Shareholders Funds		
Share capital	1	2,700,000
Reserves and surplus	2	8,50,000
2 Current liabilities		
Trade payables	3	1,60,000
Total		<u>3,710,000</u>
II. ASSETS		
1. Non-current assets		
Fixed assets		
Tangible assets	4	3,500,000
2. Current assets		
Cash and cash equivalents (bank)		2,10,000
Total		<u>3,710,000</u>

Notes to Accounts

1. Share capital

150000 equity shares of

Rs 10 each, Rs 8 paid

12,00,000

15000 preference shares of

Rs. 100 each

15,00,000

27,00,000

2. Reserves and surplus

Security premium

10,000

General reserve

2,70,000

Surplus

5,70,000

8,50,000

3. Trade payables

Creditors

1,60,000

1,60,000

4. Tangible assets

Building

20,00,000

Plant

15,00,000

35,00,000

The company resolved :

- to convert partly paid up shares into fully paid up on 1st April, 2017 without asking shareholders to pay for the same
- to redeem preference shares at a premium of 10% and issue sufficient number of 12% preference shares of Rs. 100 each at 10% premium
- The company sold plant costing Rs. 230000 for Rs. 200000
- Payments to a preference shareholder holding 500 shares could not be made as his address was not with the company

sinking fund table shows that Rs. 0.232012 invested annually at 5% compound interest amounts to Re. 1 at the end of four years. Investments were made in multiples of 100 only. On 31st March 2018 investments were sold for Rs 402000 and the debentures were redeemed. Show the following accounts for four years commencing from 1st April 2014 assuming that bank balance on 31st March 2018 was Rs 1550000 before receipt of interest on sinking fund for the year 2017-18 :

- (i) Debentures A/c
- (ii) Debentures Sinking Fund A/c
- (iii) Debentures Sinking Fund Investment A/c
- (iv) Bank A/c
- (v) Premium on Redemption of debenture A/c.

विकास आपन लि० ने 1-4-2014 का 100 रु० प्रति बाले 50,000, 12% ऋण समूह पर निर्मित किये जो 4 वर्ष बाद 10% प्रीमियम पर पुनः भुगतान होने थे। ऋण के मोचन के उद्देश्य से एक ऋणोद्यम निधि बनाने का निर्णय लिया गया। इस ऋणोद्यम निधि से किये निवेश से 5% प्रति वर्ष ब्याज आने की अपेक्षा है। इस निधि की सारणी का संदर्भ करके ज्ञात होता है कि 0.232012 का वार्षिक निवेश 5% चक्रवृद्धि ब्याज पर 4 वर्ष में 1 रुपये हो जाता है। निवेश 100 के गुणा में किये जाते हैं। 31-3-2018 को निवेशों को 4,020,000 रुपये में बेच दिया गया तथा ऋणों को मोचन किया गया। 1-4-2014 से प्रारम्भ 4 वर्षों के लिये निम्न खाते दर्शाएँ। यह मानिए कि वर्ष 2017-18 के ऋणोद्यम निधि से ब्याज प्राप्त होने से पूर्व बैंक शेष 31-3-2018 को 15,50,000 रुपये था।

(v) The company issued fully paid bonus shares to equity shareholders at the rate of 2 shares for every 5 shares held

Pass the Journal entries to record the above transactions.

कम्पनी ने निम्न किये कि :

- (i) 1-4-2017 को आंशिक दल अंशों को पूर्ण प्रदत्त अंशों में रूपान्तरित किया जाये जिना उनके अंशधारियों से उसके लिये पैसा माँगे।

- (ii) अधिमान अंशों का 10% प्रीमियम पर मोचन किया जाये और उपयुक्त संख्या में 100 रुपये बाले 12% अधिमान अंशों का 10% प्रीमियम पर निर्माण किया जाये।
- (iii) 2,30,000 रुपये के संयंत्र को 2,00,000 रुपये में बेचा गया।
- (iv) 500 अंश के अधिमान अंशधारियों को भुगतान नहीं किया गया क्योंकि उसका पता कम्पनी के पास नहीं था।
- (v) कम्पनी ने समस्त अंशधारियों को पूर्ण प्रदत्त बोनस अंश, 5 अंशों के धारक को 2 बोनस अंश के अनुपात में जारी किये।

उपरोक्त लेन-देनों के लिये जर्नल प्रविष्टियाँ कीजिये। 10

Or (अथवा)

Vikas Iron Ltd. issued on 1st April 2014, 50000, 12% debentures of Rs. 100 each at par repayable at the end of 4 years at 10% premium. It was decided to create a sinking fund for the purpose of redemption of debentures. Investments made out of sinking fund are expected to earn interest at 5% p.a. Reference to

- (i) ऋणपत्र खाता
(ii) ऋणपत्र शोधन निधि खाता
(iii) ऋणपत्र शोधन निधि निवेश खाता
(iv) बैंक खाता
(v) ऋणपत्र मोचन पर प्रीमियम खाता ।

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2. Sonal Limited has authorised capital of Rs. one crore consisting of 1000000 equity shares of Rs. 10 each. Following is the trial balance of the company as at 31st March, 2018 :

सोनल लि० की अधिकृत पूँजी एक करोड़ रुपये की 10 रुपये वाले 10,00,000 समता अंशों में बंटी है। 31-3-2018 को कम्पनी का चिट्ठा निम्न है :

Debit	Amount (Rs.)	Credit	Amount (Rs.)
Calls in arreas	200000	Sales	15620000
Purchases	8770000	Creditors	500000
Advance tax paid	2450000	12% Debentures	1000000
Salaries	2000000	General reserve	580000
Advertisement	1000000	Salaries outstanding	20000
Loose tools	200000	Commission	80000
Rent	1100000	Provision for depreciation	
Prepaid rent	30000	Plant	500000
Interest on debentures	100000	Furniture	300000
Plant	2500000	Surplus	570000
Furniture	1300000	Commission received	
Debtors	800000	in advance	30000

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Stock	450000	Share capital	2000000
Bad debts	50000	Provision for tax	1250000
Bank balance	450000		
Buildings	1050000		
	<u>22450000</u>		<u>22450000</u>

Additional information :

- (a) Rs. 200000 is outstanding for advertisement
(b) Provide depreciation on plant at 20% p.a. and on furniture at 10% p.a. on written down value basis
(c) Maintain a provision for doubtful debts at 5%
(d) The directors proposed a dividend of 30% on paid up share capital. Corporate dividend tax is to be charged at 20.358%
(e) Make a provision of 25.75% for income tax (including cess)
(f) Transfer Rs 500000 to General Reserve
(g) Closing stock is Rs 2000000.

You are required to prepare Statement of Profit and Loss for the year ended 31st March, 2018 and Balance Sheet as at that date. Prepare Notes to Accounts also.

अतिरिक्त सूचनाएँ :

- (a) विज्ञापन के 2,00,000 रुपये बकाया हैं।
(b) संयंत्र पर 20% वार्षिक और फर्नीचर पर 10% वार्षिक मूल्यहास, अपलिखित मूल्य के आधार पर, का प्रयोजन कीजिये।
(c) सदिग्ध प्रावधानों को 5% पर बनाये रखिए।
(d) निदेशकों ने प्रदत्त अंश पूँजी पर 30% लाभांश का प्रस्ताव दिया है। निगम लाभांश कर 20.358% लगाना है।

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P.T.O.

Show how the proposed dividend and CDT are to be shown. Also show how these items will appear in company's balance sheet as at 31st March, 2018.

31-3-2018 को समाप्त वर्ष के लिये दिखा लिये कि 31-3-2018 को समाप्त वर्ष से पूर्व लाभ 36,00,000 रुपये रहा। पूर्व वर्ष से 20,80,000 रुपये क्रेडिट शेष आने लगा गया था। प्रस्तुत अंश पूँजी में 10,00,000 समता अंश 10 रुपये प्रति तथा 1,00,000, 7% अधिमान अंश 100 रुपये प्रति के हैं। कम्पनी ने आयकर के लिए 25.75% का प्रावधान किया है। वर्ष के दौरान 2016-17 के लिए 15,00,000 रुपये लाभ अंश का मुतान किया गया। तुलन-पत्र की तिथि के बाद कम्पनी ने निम्नलिखित विनियोगों का प्रस्ताव किया :

- (i) अधिमान अंशों पर लाभ अंश का मुतान किया जाये।
- (ii) समता अंशधारियों को 10% से अन्तिम लाभ अंश का मुतान किया जाये।
- (iii) वर्तमान वर्ष के लाभ अंशों में से 10% सामान्य संवय को इस्तेमाल किया जाये।

(iv) निम्न लाभ अंश कर @ 20.358% का प्रावधान करना है।
कम्पनी अधिनियम, 2013 की अनुसूचि III के अनुसार संवय व अधिव्यय से सम्बन्धित लेखा नोट बनाएँ। प्रस्तावित लाभ अंश तथा CDT किस तरह दिखाने जाते हैं, बताइये। 31-3-2018 को कम्पनी के तुलन-पत्र में ये मद किस प्रकार लेखा किये जायेंगे?

P.T.O.

Vaishnav Electronics Ltd as at 31st March, 2017 :

(e) आयकर (उपकर जोड़कर) के लिए 25.75% का प्रावधान कीजिये।

(f) 5,00,000 रु० सामान्य संवय को इस्तेमाल करने हैं।

(g) अन्तिम रहलिया 20,00,000 रुपये है।

31-3-2018 को समाप्त वर्ष के लिये आपको लाभ-हानि विवरण तथा उसी तिथि का तुलन-पत्र तैयार करना है। खातों के लिए नोट भी तैयार कीजिये।

Or (अथवा)

(a) For the year ended 31st March, 2018 the profit of Divya Ltd before tax amounted to Rs. 3600000. There was a credit balance of 2080000 brought forward from the previous year. The paid up share capital consisted of 1000000 equity shares of Rs. 10 each and 100000, 7% preference shares of Rs. 100 each. The company makes a provision of 25.75% for income tax. The company paid dividend for 2016-17, Rs. 1500000 during the year. Following appropriations were proposed by the company after the date of balance sheet :

- (i) To pay dividends on preference shares,
- (ii) To pay final dividend @ 10% to equity shareholders,
- (iii) To transfer 10% of the current year profits to general reserves,
- (iv) Provide corporate dividend tax @ 20.358%.

Prepare Notes to Accounts in respect of Reserves and Surplus as per Schedule III of the Companies Act, 2013.

31-3-2017 को वैष्णव इलेक्ट्रॉनिक्स के चिट्ठे से निम्न उद्धरण लिये गये हैं :

Particulars	Debit (Rs.)	Credit (Rs.)
Provision for tax (2015-16)		1500000
Advance tax paid (2015-16)	1450000	
Advance tax paid (2016-17)	1750000	
Tax deducted at source (2016-17)	75000	
Surplus (April 1, 2016)		1500000

The assessment for the year 2015-16 was finalised during the year 2016-17. The total tax liability for the year 2015-16 was fixed at Rs. 1650000 and the net amount payable for the year 2015-16 is paid during October 2016. The net profit before tax for the year 2016-17 amounts to Rs. 6000000. Assume tax rate at 30.9%.

Pass journal entries and show how the various items relating to tax will appear in the balance sheet as at 31st March, 2017.

वर्ष 2015-16 का निर्धारण 2016-17 में किया गया जिसका कुल कर-दायित्व 16,50,000 रुपये स्थिर किया गया। वर्ष 2015-16 के लिये देय सकल राशि का भुगतान अक्टूबर 2016 में किया गया। वर्ष 2016 का कर से पूर्व सकल लाभ 60,00,000 रुपये रहा। कर की दर 30.9% मानिए।

जर्नल प्रविष्टियाँ बनाइए और दिखाइये कि कर से सम्बन्धित विभिन्न मद 31-3-2017 के तुलनपत्र में किस प्रकार दिखेंगे। 5

(c) Explain the yield method of valuation of equity shares with example.

समता अंशों के मूल्यांकन की प्राप्ति विधि को सोदाहरण समझाइए। 5

3. (a) Write a short note on super profit method of valuation of goodwill with example.

ख्याति के मूल्यांकन के लिये सुपर लाभ विधि पर सोदाहरण संक्षिप्त टिप्पणी लिखिये। 5

(b) Following is the balance sheet of Julie Limited as at 31st March 2017 :

जूली लि० का 31-3-2017 का तलपट निम्न है :

Particulars	Note No.	Rs.
EQUITY AND LIABILITIES		
Shareholders funds		
Share capital	1	80,00,000
Reserves and surplus	2	-31,00,000
Non-current liabilities		
Long term borrowings (15% Deb)		20,00,000
Current liabilities		
Trade payables		16,80,000
Other current liabilities (interest due on debentures)		6,00,000
Total		<u>91,80,000</u>
ASSETS		
Non-current assets		

Fixed assets	
Tangible assets	6000000
Intangible assets (Goodwill)	1000000
Current assets	2180000
Total	<u>9180000</u>

Notes to Accounts

Share capital

600000 equity shares of Rs. 10 each, fully paid	60,00,000
20000 preference shares of Rs. 100 each	20,00,000
	<u>80,00,000</u>

Reserves and surplus

Deficit (negative balance in income statement)	-31,00,000
	<u>-31,00,000</u>

Trade payables

Creditors	16,80,000
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Following scheme of reconstruction was approved by the H.Court :

- (a) Equity shares are to be sub-divided into equity shares of Rs 10 each and each shareholder shall surrender 70% of his holding for the purpose of reissue to debenture-holders and creditors.
- (b) Out of shares surrendered 120000 shares issued to preference shareholders in full settlement of their claim.

(c) Debenture-holders total claim is reduced to Rs. 1400000 and is satisfied by issue of 140000 shares, out of shares surrendered

(d) Creditors' claim is reduced by 50% and in consideration they receive 40000 shares out of shares surrendered

(e) The remaining surrendered shares are cancelled

(f) Goodwill and negative balance in surplus account are to be written off and fixed assets are reduced by Rs. 2000000.

Journalise the above transactions and prepare Reconstruction account.

उच्च न्यायालय ने पुनःनिर्माण की निम्न योजना का अनुमोदन किया :

- (i) समता अंशों को 10 रुपये के समता अंशों में उपविभाजित करना है और प्रत्येक अंशधारक को अपने स्वामित्व के 70% अंश समर्पित करने होंगे ऋणपत्रधारक व लेनदारों को पुनर्निर्गमित करने के उद्देश्य से।
- (ii) समर्पण किये अंश में से 1,20,000 अंश उनके दावे के पूर्ण भुगतान में अधिमान अंशधारियों को निर्गमित किये गये।
- (iii) ऋणपत्रधारकों के कुल दावे घटकर 14,00,000 रु० रह गये और समर्पित अंशों में से 1,40,000 अंशों के निर्गमन से सन्तुष्ट किये गये।
- (iv) लेनदारों के दावे 50% घटाये गये तथा भुगतान में समर्पित अंशों में से उन्हें 40,000 अंश दिये गये।

(v) ख्याति तथा आधिक्य खाते में ऋण शेष अपलिखित किये गये और स्थाई सम्पत्तियों को 20,00,000 रुपये से कम किया गया। उपरोक्त लेन-देनों की जर्नल प्रविष्टि कीजिए तथा पुनःनिर्माण खाता तैयार कीजिये। 10

Or (अथवा)

Following is the Balance Sheet of Vriti Ltd. as at 31st March 2017:

वृत्ति लि० का 31-3-2017 का तलपट निम्न है :

Particulars	Note No.	Rs.
EQUITY AND LIABILITIES		
Shareholders funds		
Share capital	1	14,00,000
Reserves and surplus	2	-5,90,000
Non-current liabilities		
Long term borrowings	3	6,00,000
Current liabilities		
Trade payables	4	3,00,000
Other current liabilities (interest due on debentures)		60,000
Total		<u>17,70,000</u>
ASSETS		
Non-current assets		
Fixed assets		
Tangible assets	5	7,70,000
Intangible assets	6	1,40,000

Non-current investments

Long term loans and advances

Other non current assets

Current assets

Inventories

4,00,000

Trade receivables

3,60,000

Cash and cash equivalents (bank)

1,00,000

Total

17,70,000

Notes to Accounts

1 Share capital

10000 equity shares of Rs. 100 each,
fully paid

10,00,000

4000 preference shares of Rs. 100 each

4,00,000

14,00,000

2 Reserves and surplus

Deficit (negative balance in income
statement)

-5,90,000

-5,90,000

3 Long term borrowings

10% Debentures

4,00,000

Loan

2,00,000

6,00,000

4 Trade payables

Creditors

3,00,000

3,00,000

5 Tangible assets

Freehold premise

5,00,000

Machinery

2,70,000

7,70,000

6 Intangible assets

Patents
1,40,000

A new company Garima Ltd. was formed to take over the

business of Vriti Ltd. Garima Ltd to issue one equity share of

Rs. 100 each, Rs. 60 paid in exchange of every two shares in

Vriti Ltd.

Preference shareholders to get 15, 11 % preference shares of

Rs. 10 each in exchange of two preference shares of Vriti

Ltd.

Liability in respect of 10% debentures and interest due thereon

is to be discharged by Garima Ltd. by issue of Rs. 100 equity

shares fully paid.

The freehold premises are to be revalued at 20% more,

machinery at Rs. 90000, trade receivables are reduced by 10%,

and the value of inventories to be reduced to Rs. 160000, patents

to have no value.

The preliminary expenses amounted to Rs. 5000.

Prepare necessary ledger accounts in the books of Vriti Ltd to

close its books and pass journal entries in the books of Garima

Ltd.

वृत्ति लि० के व्यवसाय की लेन के लिये एक नई कम्पनी गरिमा लि०

बनाई गई। गरिमा लि० ने वृत्ति लि० के दो अंशों के बदले एक

समतल अंश 100 रु० प्रति का, 60 रुपये दत्त, निर्माण करने का

विषय किया।

वृत्ति लि० के दो अधिमान अंश के अधिमान अंशधारक को बदले

में 15, 11% अधिमान अंश 10 रुपये प्रति अंश वाले, दिये

जायेंगे।

10% ऋण और उन पर देय ब्याज के सम्बन्ध में देयता को गरिमा

लि० पूर्ण प्रदत्त 100 रुपये प्रति के समतल अंशों के निर्माण से निर्वहन

करेंगी।

क्रीदल परिसर का 20% अधिक से पुनः मूल्यांकन होगा। संयंत्र का

90,000 रुपये में, व्यवसाय के प्राप्ति को 10% से कम किया जायेगा

और रकतिये के मूल्य को 1,60,000 रु० से कम किया जायेगा।

पेटन्ट का कोई मूल्य नहीं है।

शुल्कवाली व्यय 5000 रुपये के थे।

वृत्ति लि० की पुस्तकें बन्द करने के लिये उसकी पुस्तकों में आवश्यक

लेजर खातों को बनाइए और गरिमा लि० की पुस्तकों में जर्नल

प्रविष्टियाँ कीजिए।

15

4. Neha Ltd. took over the control of Nandini Ltd. on 1-10-2017

by acquiring 32000 shares for Rs 480000. Following are

the balance sheets of the two companies as at 31st March

2018:

नेहा लि० ने 1-10-2017 को 4,80,000 रु० के 32,000 अंश

खरीदकर नान्दिनी लि० पर नियन्त्रण ले लिया। 31-3-2018 को दोनों

कम्पनियों के तालपट्ट निम्न थे :

Particulars	Note No.	Neha Ltd. (Rs.)	Nandini Ltd. (Rs.)
I. EQUITY AND LIABILITIES			
1. Shareholders funds			
Share capital	1	1000000	400000
Reserves and surplus	2	480000	300000
2. Non-current liabilities			
Long term borrowings		500000	
3. Current liabilities			
Trade payables	3	160000	180000
Total		<u>2140000</u>	<u>880000</u>
II. ASSETS			
1. Non-current assets			
Fixed assets			
Tangible assets	4	720000	440000
Intangible assets (Goodwill)			60000
Non-current investments: (32000 shares in Nandini Ltd.)			480000
2. Current assets			
Inventories		200000	180000
Trade receivables		40000	150000
Cash and cash equivalents		700000	50000
Total		<u>2140000</u>	<u>880000</u>

Notes to Accounts

1. Share capital

	Fully paid shares of Rs 10 each	
	<u>1000000</u>	<u>400000</u>
2 Reserves and surplus		
General reserve	200000	120000
Surplus	280000	180000
	<u>480000</u>	<u>300000</u>
3. Trade payables		
Creditors	160000	100000
Bills payables		80000
	<u>160000</u>	<u>180000</u>
4. Tangible assets		
Building	400000	260000
Plant	320000	180000
	<u>720000</u>	<u>440000</u>

The surplus and general reserve of Nandini Ltd. showed a balance of Rs. 100000 and Rs. 120000 respectively on 1st April, 2017. A dividend was paid at the rate of 10% by Nandini Ltd. in the month of November 2017 for the year 2016-17. This dividend was credited to income statement by Neha Ltd.

The bills payables of Nandini Ltd. were all issued in favour of Neha Ltd. The receiving company got these bills discounted with bank. Creditors of Nandini Ltd. included Rs. 40000 due to Neha Ltd. for goods supplied by latter company. Stock of Nandini Ltd includes Rs. 16000 of stock purchased from Neha Ltd. at a profit of 25% on cost. The plant of Nandini Ltd. with a book value of Rs. 200000 on 1-4-2017 was revalued at Rs. 300000 at the time of taking the control of Nandini Ltd. The

new value has not been incorporated in the books. Prepare consolidated balance sheet as at 31st March 2018. Show all calculations and workings clearly. Ignore corporate dividend tax.

निम्नी लिं की आधिक् व समान् संघ में 1-4-2017 की शेष 1,00,000 रुपय तथा 1,20,000 रुपय कभशः श। वर्ष 2016-17 को नवम्बर माह के लिये निम्नी लिं ने 10% का लाभांश दिया। यह लाभांश वेहा लिं की आय विवरणी में क्रेडिट कर दिया गया। निम्नी लिं के देय बिल वेहा लिं के पक्ष में निर्माण कर दिये गए। एने वाली कम्पनी ने इन अंशों को बैंक से डिस्काउन्ट करा लिया। निम्नी लिं के लेनदारों में 40,000 रुपय वेहा लिं के भी निकल रहे हैं। निम्नी लिं के स्कन्ध में 16,000 रुपय का वेहा लिं से स्कन्ध लागत पर 25% मुनाफे पर लिया गया। निम्नी लिं के खात, जिसका पुस्तक मूल्य 2,00,000 रुपय था के खात को 3,00,000 रुपय का पुनःमूल्यांकन निम्नी लिं के नियन्त्रण लेने के समय हुआ। नई कीमत को अभी तक पुस्तकों में दिखाया नहीं गया है। 31-3-2018 को समीकित तुलन-पत्र तैयार कीलिए। सभी कादपूर्त तथा गणनाएँ स्पष्टतया दिखाइए। निगम कर की उपेक्षा कीलिये। 15

Or (अथवा)

The following are the balance sheets of Suhani Ltd. and Radhika Ltd. as at 31st March 2018 :

31-3-2018 के सुहानी लिं व राधिकी लिं के लेनपट निम्न रूपे :

Particulars	Note	Suhani Ltd. (Rs.)	Radhika Ltd. (Rs.)
I. EQUITY AND LIABILITIES			
1. Shareholders funds			
Share capital	1	2000000	500000
Reserves and surplus	2	600000	1500000
2. Current liabilities			
Trade payables		400000	200000
Total		<u>3000000</u>	<u>2200000</u>
II. ASSETS			
Non-current assets			
Fixed assets			
Tangible assets	3	1000000	500000
Non current investments			1000000
(3000 shares in Radhika Ltd.)		1000000	
2. Current assets			
Inventories		500000	450000
Trade receivables		300000	1000000
Cash and cash equivalents		200000	250000
Total		<u>3000000</u>	<u>2200000</u>
Notes to Accounts			
1. Share capital			
Fully paid shares of Rs. 10 each		<u>2000000</u>	<u>500000</u>
2. Reserves and surplus			
General reserve		500000	500000
(as on 1-4-2017)			
	21		

Note Suhani Radhika
No. Ltd. (Rs.) Ltd. (Rs.)

Prepare consolidated balance sheet as at 31st March 2018.
Show all calculations and workings clearly.

अतिरिक्त सूचनाएँ :

(i) 1 जुलाई 2017 को सुहानी लिमिटेड के खरीदे गये अंश राशि का लिमिटेड में आ गये।

(ii) 1 अप्रैल, 2017 को राशि का लिमिटेड पर अतिरिक्त शेष 4,00,000 रुपये थे।

(iii) राशि का लिमिटेड ने सामान्य संवय में से सितंबर 2017 में धारण किये प्रत्येक दो अंशों के लिये 1 अंश के अनुपात में बोनस अंश निर्मित किये परन्तु बोनस अंश की प्रविष्टि अभी बाकी है।

(iv) जून 2017 के दौरान 1,00,000 रुपये की लागत का माल एक दुर्घटना में नष्ट हो गया था। बीमा कम्पनी ने राशि का लिमिटेड को केवल 75,000 रुपये का भुगतान किया।

(v) राशि का लिमिटेड के लेनदारों में सुहानी लिमिटेड द्वारा आपूर्ति किया गया 20,000 रुपये का माल भी है। जिस पर सुहानी लिमिटेड ने लागत पर 25% का लाभ कमाया था। वर्ष के अन्त में आधा माल बिक्री रखा है।

(vi) राशि का लिमिटेड का संयंत्र, जिसका पुस्तक मूल्य 2,00,000 रुपये था, 1-4-2017 को 3,00,000 रुपये का पुनः मूल्यांकित किया गया जिस लिये पर सुहानी लिमिटेड ने नियंत्रण लिया। नया मूल्य पुस्तकों में दर्शाया नहीं गया है।

31-3-2018 को समीकित चिट्ठा बनाइये। सभी गणनाएँ व कार्यवाही स्पष्ट दर्शाइये।

Suplus	100000	600000	1500000
Tangible assets	400000	320000	
Building	600000	180000	
Plant	1000000	500000	

Additional Information :

(i) Suhani Ltd. purchased shares in Radhika Ltd. on July 1, 2017
(ii) Balance of surplus of Radhika Ltd. on 1st April 2017 was Rs. 400000

(iii) Radhika Ltd. distributed bonus shares out of general reserve in the ratio of one share for every two shares held in September 2017 but the entry for bonus shares has not yet been passed by Radhika Ltd.

(iv) During June 2017 goods costing Rs. 100000 were destroyed in an accident. The insurance company paid Rs. 75000 only to Radhika Ltd.

(v) Creditors of Radhika Ltd. include Rs. 20000 for goods supplied by Suhani Ltd on which Suhani Ltd. made a profit of 25% on cost. Half of the goods were unsold at the end of the year.

(vi) The plant of Radhika Ltd with a book value of Rs. 200000 on 1-4-2017 was revalued at Rs. 300000 at the time of taking the control of Suhani Ltd. The new value has not been incorporated in the books.

5. Tangible assets

Land and buildings	4875000	4300000
Less Accumulated depreciation	<u>-1250000</u>	<u>-1150000</u>
	3625000	3150000
Plant	<u>2700000</u>	<u>2000000</u>
Less Accumulated depreciation	<u>-450000</u>	<u>-375000</u>
	2250000	1625000
Total	<u>5875000</u>	<u>4775000</u>

Additional information :

Debentures were redeemed at 10% premium on 1st October, 2017, Investments were sold at 40% profit on cost.

During the year plant costing Rs. 300000 (accumulated depreciation thereon Rs. 110000) was sold at 40% profit on book value.

During the year building worth Rs. 575000 was purchased by issue of 25000 equity shares of Rs. 10 each at a premium of Rs. 2 per share and balance by cheque

Tax paid during the year amounted to Rs. 550000

Prepare Cash Flow Statement.

अतिरिक्त सूचनाएँ :

1 अक्टूबर 2017 को ऋणपत्रों का 10% प्रीमियम पर मोचन किया गया और निवेशों को लागत पर 40% लाभ के साथ बेचा गया।

वर्ष के दौरान 5,75,000 रुपये कीमत का भवन खरीदा गया और भुगतान में 25,000 समता अंश 10 रुपये प्रति अंश 2 रुपये प्रति अंश प्रीमियम पर दिया गया तथा शेष चैक से भुगतान हुआ।

वर्ष के दौरान 5,50,000 रुपये कर जमा किया गया।

नकद प्रवाह विवरण बनाइये।

15

Or (अथवा)

(a) Differentiate between performing and non-performing assets in relation to banking companies.

क्रियाशील सम्पत्तियों और अक्रियाशील सम्पत्तियों में बैंकिंग कम्पनियों के संदर्भ में अन्तर कीजिये।

5

(b) From the following information, compute the amount of provisions to be made in the Profit and Loss Account of a commercial bank for the year ended 31st March, 2018 :

Rs. in lakhs

(i) Standard assets (value of security Rs. 3000 lakhs)	3500
(ii) Sub-standard assets (value of security Rs. 1250 lakhs)	1500
(iii) Doubtful assets :	
Doubtful for less than one year (realisable value of security Rs. 250 lakhs)	500
Doubtful for more than one year but less than three years (realisable value of security Rs. 150 lakhs)	250
Doubtful for more than one year (No security)	200
(iv) Loss Assets	50

निम्न सूचनाओं से 31-3-2018 को समाप्त वर्ष के लिये एक वाणिज्यिक बैंक के लाभ-हानि खाते में प्रावधानों की गणना कीजिये :

रु० (लाख में)

(i) मानक सम्पत्तियाँ (प्रतिभूति का मूल्य 3000 लाख रु०)	3,500
(ii) उपमानक सम्पत्तियाँ (प्रतिभूति का मूल्य 1250 लाख रु०)	1,500
(iii) संदिग्ध सम्पत्तियाँ	
एक वर्ष से कम के लिये संदिग्ध (प्रतिभूति का प्राप्य मूल्य 250 लाख रु०)	500
एक वर्ष से अधिक व 3 वर्ष से कम के लिये संदिग्ध (प्रतिभूति का प्राप्य मूल्य 150 लाख रुपये)	250
एक वर्ष के लिये संदिग्ध (बिना प्रतिभूति)	200
(iv) हानि सम्पत्तियाँ	50
	5

(c) Explain the conditions to be satisfied in case amalgamation is in the nature of merger.

विलय की प्रकृति में समामेलन को संतुष्ट करने वाली शर्तों को समझाइए।

5

This question paper contains 8 printed pages.

Your Roll No.

Sl. No. of Ques. Paper : 3137 IC
Unique Paper Code : 22411202
Name of Paper : Corporate Laws
Name of Course : B.Com. (H)
Semester : II
Duration : 3 hours
Maximum Marks : 75

*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

*(इस प्रश्न-पत्र के मिलते ही ऊपर दिये गये निर्धारित स्थान पर
अपना अनुक्रमांक लिखिये।)*

*NOTE :- Answers may be written either in English or in Hindi;
but the same medium should be used throughout
the paper.*

*टिप्पणी : इस प्रश्न-पत्र का उत्तर अंग्रेजी या हिन्दी किसी एक भाषा
में दीजिये; लेकिन सभी उत्तरों का माध्यम एक ही होना
चाहिए।*

Attempt all questions.

All questions carry equal marks.

सभी प्रश्नों के उत्तर दीजिए।

सभी प्रश्नों के अंक समान हैं।

P.T.O.

1. (a) "A fundamental attribute of corporate personality is that a company is a legal entity distinct from its members." Discuss the above statement citing the relevant case laws.

"कारपोरेट व्यक्ति की मौलिक विशेषता है कि कम्पनी अपने सदस्यों से पृथक एक कानूनी इकाई है।" प्रासंगिक वाद विधि का हवाला देते हुए उपरोक्त कथन का विवेचन कीजिए। 5

(b) "Preliminary contracts are a nullity." Comment on the statement bringing out clearly the position of promoters with regard to these contracts.

"प्राथमिक अनुबन्ध व्यर्थ होते हैं।" इन अनुबन्धों से सम्बन्धित उनके प्रवर्तकों की स्थिति स्पष्ट करते हुए कथन पर टिप्पणी कीजिए। 5

(c) Write a short note on Licensed Company;

"लाइसेंस प्राप्त कम्पनी" पर संक्षेप टिप्पणी लिखिए। 5

Or (अथवा)

(a) What is a foreign company? Is it necessary for it to comply with the provisions of the Companies Act? If so, to what extent?

विदेशी कम्पनी क्या होती है? कम्पनी अधिनियम के प्रावधानों का अनुपालन करना क्या इसके लिये आवश्यक है? यदि हाँ, तो किस स्तर तक? 5

(b) Explain the concept of corporate personality and discuss the circumstances where the Court lifts the corporate veil to see what really lies behind.

कारप है व्यक्ति की संकल्पना समझाइए। उन परिस्थितियों का विवेचन कीजिए जिनमें कारपोरेट पदा हटाकर पीछे की संव्याई देखा है। 5

(c) Write a note on "Illegal association of persons". "व्यक्तियों के अवैध संघ" पर नोट लिखिए। 5

2. (a) On the cover page of the prospectus of a company a statement was printed in bold letters stating that the managing agent, promoters and directors with their friends and relatives have promised to subscribe shares worth Rupees ten lakhs. However, they collectively subscribed shares worth Rupees six lakhs only. Can the prospectus of the company be considered as misleading?

कम्पनी के प्रविवरण के मुखपृष्ठ पर एक कथन मोटे में छपा हुआ था कि प्रबंधन एजेंट, प्रवर्तकों और निर्देशकों और उनके मित्रों तथा सम्बन्धियों ने दस लाख रुं के अंश लेने का वादा किया है। परन्तु, उन्होंने मिलकर केवल छः लाख रुपये के अंश ही स्वीकार किए। क्या कम्पनी के प्रविवरण को भ्रामक कहा जा सकता है? 5

(b) What do you mean by "buyback of securities"? Explain the legal provisions relating to buyback of securities by a company under the Companies Act, 2013.

आप 'प्रतिभूतियों की वापसी खरीद' से क्या समझते हैं? कम्पनी अधिनियम, 2013 के अर्धीन कम्पनी द्वारा प्रतिभूतियों की वापसी खरीद से सम्बन्धित वैधानिक प्रावधानों को समझाइए। 5

(c) Discuss the binding effect of Memorandum of Association and Articles of Association of a company on the shareholders, outsiders and the company itself.

कम्पनी के अंशधारियों, बाहर वालों तथा कम्पनी स्वयं पर उसके संस्थापन प्रलेख और संस्था के अंतर्निर्णयों के बाध्यकारी प्रभाव का विवेचन कीजिए।

Or (अथवा)

(a) Write a note on 'Producer Company'.

'उत्पादक कम्पनी' पर नोट लिखिये।

(b) "An outsider is presumed to know the constitution and the statutory public documents of a company, but not what may or may not have taken place within the doors that are closed to him." Explain with reference to the doctrine of Indoor Management.

"एक बाहर वाले को कम्पनी के वैधानिक सार्वजनिक दस्तावेजों तथा उसके सविधान का ज्ञान होना परिकल्पित है, परन्तु यह नहीं कि जो दरवाजे उसके लिये बन्द हैं उनके पीछे क्या हुआ या नहीं हुआ।" आन्तरिक प्रबंधन की संकल्पना के सन्दर्भ में समझाइए।

(c) Discuss the importance of a Red Herring prospectus in the light of issue of securities by the company through book building process.

बुक बिल्डिंग प्रक्रिया के प्रयोग से कम्पनी द्वारा प्रतिभूतियों के निर्माण के प्रकाश में रेड हैरिंग प्रविचरण के महत्व का विवेचन कीजिए।

3. (a) Differentiate between right issue and bonus issue.

बोनस निर्माण तथा राइट निर्माण में अन्तर्भेद कीजिए।

(b) "Directors owe a duty of loyalty and care in performing their duties." Do you agree? Explain.

"अपने कर्तव्यों को करने के लिए निर्देशक वफादारी और देखभाल के कर्तव्य के देनदार हैं।" क्या आप सहमत हैं? समझाइए।

(c) What is the role of CSR Committee? Is it compulsory for a Company to constitute a CSR Committee?

CSR समिति की क्या भूमिका होती है? एक कम्पनी को CSR समिति गठित करना क्या आवश्यक है?

Or (अथवा)

(a) Discuss the provisions of the Companies Act, 2013 regarding holding of board's meeting through audio-visual means.

बोर्ड की बैठक को दृश्य-श्रव्य साधनों के प्रयोग से गठित करने से सम्बन्धित कम्पनी अधिनियम, 2013 के प्रावधानों का विवेचन कीजिए।

(b) State difference between transfer and transmission of shares.

अंशों के हस्तांतरण और हस्तांकन में भेद कीजिए।

relevant provisions of the Companies Act.

(b) ABC Limited has its registered office at Mumbai. The company desires to hold its AGM at New Delhi. Examine the validity of the company's desire with reference to the relevant provisions of the Companies Act.

उपरोक्त उदाहरण दीजिए।

5

(a) Distinguish between ordinary resolution and special resolution by giving suitable examples of each.

Or (अथवा)

दी सकती है। समझाइए।

5

(c) 'A faulty notice of a meeting can be fatal to the validity of a meeting.' Explain.

functions.

(b) What is an Audit Committee? Discuss its powers and functions.

(a) 'Dividend once declared cannot be revoked.' Are there any exceptions to it? Explain.

5

'भारत निदेशक' पर नोट लिखिए।

5

(c) Write a note on 'Women Director'.

company?

(b) Who can file a petition in the NCLT for winding up of a company?

(a) Write a note on 'National Company Law Tribunal'.

Or (अथवा)

(c) Write a note on 'Dematerialisation of securities'.

5

(b) State the circumstances under which a company may be wound up compulsorily by the NCLT.

5

(a) What are the provisions of the Companies Act, 2013 regarding the appointment of an Auditor?

5

(b) Discuss the removal of a Director.

5

(c) Discuss the provisions of the Companies Act, 2013 regarding the removal of a Director.

5

ABC लि० का पंजीकृत कार्यालय मुंबई में है। कम्पनी अपनी

AGM नई दिल्ली में करना चाहती है। कम्पनी अधिनियम के

प्रसंगिक प्राधानों के संदर्भ में कम्पनी की इस इच्छा की वैधता

का परीक्षण कीजिए।

5

1

कम्पनी के समापन के लिये NCLT में कौन ज्ञापन फाइल कर सकता है? 5

(c) What is Depository? Explain the benefits of Depository System.

'संग्रहस्थान' (Depository) क्या होता है? संग्रहस्थान प्रणाली के लाभ समझाइए। 5

This question paper contains 8 printed pages]

Roll No.

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S. No. of Question Paper : 2249

Unique Paper Code : 32351202 IC

Name of the Paper : Differential Equations

Name of the Course : B.Sc. (Hons.) Mathematics

Semester : II

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Use of non-programmable scientific calculators is allowed.

Section-I

1. Attempt any *three* parts. Each part is of 5 marks.

(a) Solve the initial value problem :

$$(x^2 + 1) \frac{dy}{dx} + 4xy = x, y(2) = 1.$$

(b) Determine the constant A in the following equation such that the equation is exact, and solve the resulting exact equation :

$$(x^2 + 3xy)dx + (Ax^2 + 4y)dy = 0.$$

P.T.O.

(c) Solve the differential equation :

$$x \frac{d^2y}{dx^2} + \frac{dy}{dx} = 4x.$$

(d) Solve the differential equation :

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

2. Attempt any two parts. Each part is of 5 marks.

(a) A cylindrical tank with length 5 ft and radius 3 ft is situated with its axis horizontal. If a circular bottom hole with a radius of 1 inch is opened and the tank is initially half full of xylene, how long will it take for the liquid to drain completely ?

(b) Suppose that sodium pentobarbital is used to anesthetize a dog. The dog is anesthetized when its bloodstream contains at least 45 milligrams (mg) of sodium pentobarbital per kilogram of the dog's body weight. Suppose also that sodium pentobarbital is eliminated exponentially from the dog's bloodstream, with a half life of 5 hours. What single dose should be administered in order to anesthetize a 50 kilogram dog for 1 hour ?

(c) Suppose that a motorboat is moving at 40 ft/sec when its motor suddenly quits, and that 10 seconds later the boat has slowed to 20 ft/sec. Assume that the resistance it encounters is proportional to its velocity. How far will the boat cast in all ?

Section-II

3. Attempt any two parts. Each part is of 7.5 marks.

(a) Consider the American system of two lakes : Lake Erie feeding into Lake Ontario. Assuming that volume in each lake to remain constant and that Lake Erie is the only source of pollution for Lake Ontario.

(i) Write down a differential equation describing the concentration of pollution in each of two lakes, using the variables V for volume, F for flow, $c(t)$ for concentration at time t and subscripts 1 for Lake Erie and 2 for Lake Ontario.

(ii) Suppose that only unpolluted water flows into Lake Erie. How does this change the model proposed ?

(iii) Solve the system of equations to get expression for the pollution concentration $c_1(t)$ and $c_2(t)$.

- (b) In view of the potentially disastrous effects of overfishing causing a population to become extinct, some governments impose quotas which vary depending on estimates of the population at the current time. One harvesting model that takes this into account is

$$\frac{dX}{dt} = rX \left(1 - \frac{X}{K} \right) - h_0 X.$$

- (i) Find the non-zero equilibrium population.
- (ii) At what critical harvesting rate can extinction occur ?
- (c) Consider the population of the country. Assume constant per capita birth and death rates and that the population follows an exponential growth (or decay) process. Assume there to be significant immigration and emigration of people into and out of the country.
- (i) Assuming the overall immigration and emigration rates are constant, formulate a single differential equation to describe the population size over time.

- (ii) Suppose instead that all immigration and emigration occurs with a neighbouring country, such that the net movement from one country to the another is proportional to the population difference between the two countries and such that people move to the country with the larger population. Formulate a coupled system of equations as a model for this situation.

Section-III

4. Attempt any four parts. Each part is of 5 marks.

- (a) Find general solutions (for $x > 0$) of the Euler's equation :

$$x^2 y'' + 7xy' + 25y = 0.$$

- (b) Solve the initial value problem by using the method of undetermined coefficients :

$$y'' + y = \sin x; \quad y(0) = 0, \quad y'(0) = -1.$$

- (c) Use the method of variation of parameters to find the solution of the differential equation :

$$y'' + 3y' + 2y = 4e^x.$$

- (d) A mass of 3 kg is attached to the end of a spring that is stretched 20 cm by a force of 15 N. It is set in motion with initial position $x_0 = 0$ and initial velocity $v_0 = -10$ m/s. Find the amplitude, period, and frequency of the resulting motion.
- (e) A body of mass $m = 2$ kg is attached to both a spring with a spring constant $k = 4$ and a dashpot with a damping constant $c = 3$. The mass is set in motion with initial position $x_0 = 2$ and initial velocity $v_0 = 0$. Find the position function $x(t)$ and determine whether the motion is overdamped, critically damped or underdamped. If it is underdamped, find its pseudofrequency, pseudoperiod of oscillation and its time varying amplitude.

Section-IV

5. Attempt any two parts. Each part is of 7.5 marks.

- (a) Consider a simple model for a battle between two armies. Assumed that the probability of a single bullet hitting its target is constant. Suppose that the soldiers from the red

- army are visible to the blue army. But the soldiers from the blue army are hidden.
- (i) Develop the model for describing the rate of change of number of soldiers in each of the armies.
- (ii) By making appropriate assumptions, extend the model to include the reinforcements if both of the armies receive reinforcements at constant rates.
- (b) Consider a disease where all those who are infected remain contagious for life. Assume that there are no births and deaths.
- (i) Write down suitable word equations for the rate of change of number Susceptible and Infective and hence develop a pair of differential equations.
- (ii) Use the chain rule to find a relationship between the number of susceptibles and the number of infectives.
- (iii) Draw a sketch of typical phase-plane trajectories. Deduce the direction of travel along the trajectories providing reasons.

(c) . A model of a three species interaction is :

$$\frac{dX}{dt} = a_1X - b_1XY - c_1XZ,$$

$$\frac{dY}{dt} = a_2XY - b_2Y,$$

$$\frac{dZ}{dt} = a_3XZ - b_3Z.$$

Where a_i, b_i, c_i for $i = 1, 2, 3$ are all positive constants.

Here $X(t)$ is the prey density and $Y(t)$ and $Z(t)$ are the two predator species densities.

- (i) Find all possible equilibrium populations. Is it possible for all three populations to coexist in equilibrium ?
- (ii) What does this suggest about introducing an additional predator into an ecosystem ?

This question paper contains 7 printed pages]

Roll No.

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S. No. of Question Paper : 2248

Unique Paper Code : 32351201

IC

Name of the Paper : Real Analysis

Name of the Course : B.Sc. (H) Mathematics

Semester : II

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

All questions are compulsory.

There are internal choices in Q. Nos. 2-5.

I. Prove or disprove : $6 \times 2\frac{1}{2} = 15$

(a) If $x \in \mathbb{R}$, $x > 0$, then $\frac{1}{x} > 0$.

(b) If s is an upper bound of a non-empty set S such that $s \in S$, then $s = \sup S$.

(c) A sequence (x_n) satisfying $\lim (x_{n+1} - x_n) = 0$ is convergent.

P.T.O.

- (d) $\lim ((a^n + b^n)^{1/n}) = b$, where $0 < a < b$.
- (e) The series $\sum_{n=1}^{\infty} (\cos nx)$ converges for all $x \in \mathbf{R}$.
- (f) $\sum_{n=1}^{\infty} \frac{n2^n}{(n^2 + 1)}$ is a convergent series.

2. Answer any *three* parts : 3×5=15

- (a) State and prove the Density Theorem for real numbers.
- (b) (i) Let $a, b \in \mathbf{R}$ and suppose that for every $\varepsilon > 0$, we have $a \leq b + \varepsilon$. Show that $a \leq b$.
- (ii) Let S be a non-empty subset of \mathbf{R} . Show that $u \in \mathbf{R}$ is an upper bound of S if and only if the conditions $t \in \mathbf{R}, t > u$ imply $t \notin S$.
- (c) Let S be a non-empty bounded set in \mathbf{R} and let $b < 0$. Prove that $\inf(bS) = b(\sup S)$ and $\sup(bS) = b(\inf S)$.
- (d) If S is a non-empty subset of \mathbf{R} , show that S is bounded if and only if there exists a closed and bounded interval I of \mathbf{R} such that $S \subseteq I$.

3. Answer any *three* parts : 3×5=15

- (a) Find the limit of the following sequences whose n th term is given by :
- (i) $x_n = \frac{n}{b^n}$, where $b > 1$
- (ii) $y_n = \frac{\sin n}{n} + \sqrt{n}(\sqrt{n+1} - \sqrt{n})$.
- (b) Prove that if a sequence (x_n) is increasing and bounded above, then it converges to u where u is the least upper bound of the set $\{x_n : n \in \mathbf{N}\}$.
- (c) If a sequence (x_n) of real numbers converges to a real number x , prove that every subsequence (x_{n_k}) of (x_n) converges to x .
- (d) State the Cauchy Convergence Criterion for sequences. Use it to show that the sequence (x_n) defined by

$$x_n = \frac{1}{1!} - \frac{1}{2!} + \dots + \frac{(-1)^{n+1}}{n!}$$

is convergent.

4. Answer any *three* parts : 3×5=15

- (a) Use the integral test to check the convergence of the series :

$$\sum_{n=2}^{\infty} \frac{1}{n \log n}$$

- (b) When do we say that the series $\sum_{n=1}^{\infty} a_n$ is absolutely convergent ? Show that the series :

$$\sum_{n=1}^{\infty} \frac{(-1)^n}{n} (\sqrt{n+1} - \sqrt{n})$$

is absolutely convergent.

- (c) Test the convergence of the following series :

(i) $\sum_{n=1}^{\infty} \frac{n^{n^2}}{(n+1)^{n^2}}$

(ii) $\sum_{n=1}^{\infty} (-1)^n \frac{(n!)^2}{(2n)!}$

- (d) (i) Find all $x \in \mathbb{R}$ for which the series $\sum_{n=1}^{\infty} e^{nx}$ converges.

- (ii) Show that the series $\sum_{n=1}^{\infty} \log \left(\frac{n}{n+1} \right)$ is divergent.

5. (a) (i) Let X and Y be non-empty sets and let

$h : X \times Y \rightarrow \mathbb{R}$ have bounded range in \mathbb{R} . Let

$f : X \rightarrow \mathbb{R}$ and $g : Y \rightarrow \mathbb{R}$ be defined by

$$f(x) = \sup \{h(x, y) : y \in Y\},$$

$$g(y) = \inf \{h(x, y) : x \in X\}.$$

Prove that :

$$\sup \{g(y) : y \in Y\} \leq \inf \{f(x) : x \in X\}.$$

- (ii) Give an example of a set which has exactly two limit points. 4,1

Or

- (i) Show that for any real numbers p, q and rational number r such that $r < p + q$, there exist rational numbers $r_1 < p$ and $r_2 < q$ such that $r = r_1 + r_2$.

- (ii) Provide a bijection between \mathbb{N} and the set of all odd integers greater than 49. 3,2

is conditionally convergent.

$$\sum_{n=1}^{\infty} \frac{(-1)^n n}{n^2 + 1}$$

(c) State the Alternating Series Test. Show that the series :

convergent ? If yes, find its limit.

$$x_n = \frac{n^2}{n^3 + n + 1} + \frac{n^2}{n^3 + n + 2} + \dots + \frac{n^2}{n^3 + 2n}$$

Is the sequence (x_n) where

Or

bounded ? Justify.

$$x_n = \frac{n^3 + 3n^2}{n^2} - \frac{n+1}{n^2}$$

(ii) Is the sequence (x_n) where

$$|x_n| > A \text{ for all } n \geq N.$$

number A and a natural number N such that

(b) (i) If $\lim (x_n) = x \neq 0$, prove that there is a positive

$$\sum_{n=1}^{\infty} a_n b_n$$

then prove that the series

If the series $\sum_{n=1}^{\infty} a_n^2$ and $\sum_{n=1}^{\infty} b_n^2$ are convergent,

Or

[This question paper contains 7 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **2276** **IC**

Unique Paper Code : 32371202

Name of the Course : **B.Sc. (Hons.) Statistics**

Name of the Paper : Algebra

Semester : II

Time : 3 Hours **Maximum Marks : 75**

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt **six** questions in **all**, selecting **three** from each **section**.

Section - A

1. (a) Solve the equation $x^3 - 5x^2 - 16x + 80 = 0$, given that the sum of two of its roots is zero.

6

P.T.O.

(b) If α, β, γ are the roots (all non zeros) of the equation $x^3 - px^2 + qx - r = 0$, then find the value of:

(i) $(\beta + \gamma)(\gamma + \alpha)(\alpha + \beta)$

(ii) $\sum(\alpha/\beta)$ 6.5

2. (a) (i) Find the value of $\alpha^{-5} + \beta^{-5} + \gamma^{-5}$, where α, β, γ are the roots of $x^3 + 2x^2 - 3x - 1 = 0$. 3

(ii) Form an equation whose roots are the ratios of the roots α, β, γ of the equation, $x^3 + qx + r = 0$. 3

(b) Prove that the set of vectors $\alpha = (2, 2, -3)$; $\beta = (0, -4, 1)$; $\gamma = (3, 1, -4)$ is linearly dependent. 3.5

(c) Given the basis vectors $e_1, [0, 1, 1]$ and e_3 for E^3 . Which vectors can be removed from the basis and be replaced by $b = [4, 3, 6]$, while still maintaining a basis? 3

3. (a) Convert the given matrix A to an echelon form and mark the pivot positions in the final matrix. 6

$$A = \begin{pmatrix} 0 & -3 & -6 & 4 & 9 \\ -1 & -2 & -1 & 3 & 1 \\ -2 & -3 & 0 & 3 & -1 \\ 1 & 4 & 5 & -9 & -7 \end{pmatrix}$$

(b) Show that the system of equations

$$\lambda x + y + z = 1$$

$$x + \lambda y + z = \lambda$$

$$x + y + \lambda z = \lambda^2$$

has a unique solution provided $\lambda \neq -2$ or $\lambda \neq 1$ and find that solution. State the nature of solution when $\lambda = 1$ and $\lambda = -2$.

4. (a) Solve : 6.5

$$\Delta = \begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0$$

- (b) Prove that a skew-symmetric determinant of odd order vanishes. 6

Section - B

5. (a) If $A = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$, then prove that :

$$(aI + bA)^n = a^n I + na^{n-1} bA \quad 5$$

- (b) Define an Idempotent matrix. If A and B are idempotent matrices, then show that A + B will be idempotent if and only if $AB = BA = O$, where O is a null matrix. 7.5

6. (a) If A is a symmetric and B is a skew-symmetric matrix, both of order n such that (A+B) is non singular and $C = (A + B)^{-1} (A - B)$, then prove that : 6

(i) $C'(A + B)C = A + B$

(ii) $C'(A - B)C = A - B$

(iii) $C'AC = A$

- (b) If a, b and c are all unequal, then find, using only row operations, the rank of the matrix : 6.5

$$\begin{pmatrix} 0 & b-a & c-a & b+c \\ a-b & 0 & c-b & c+a \\ a-c & b-c & 0 & a+b \\ b+c & c+a & a+b & 0 \end{pmatrix}$$

7. (a) State and prove Cayley- Hamilton theorem. 6

(b) Given the following matrices A and B

$$A = \left(\begin{array}{cc|cc} 3 & 2 & 1 & 4 \\ 4 & 6 & 5 & 0 \\ \hline 7 & 1 & 0 & 2 \end{array} \right) \quad B = \left(\begin{array}{c} 1 & 7 \\ 0 & 6 \\ \hline 1 & 2 \\ 5 & 1 \end{array} \right)$$

Prove by direct multiplication and by block multiplication that the same result AB is obtained either way. 6.5

8. (a) Reduce the following symmetric matrix to the diagonal form and interpret the result in terms of quadratic forms. 6.5

$$A = \begin{pmatrix} 1 & 1 & -1 \\ 1 & 2 & 1 \\ -1 & 1 & 3 \end{pmatrix}$$

(b) Let G be a generalized inverse of X'X, then prove that: 6

(i) G' is also a generalized inverse of X'X.

(ii) $XGX'X = X$; i.e., GX' is a generalized inverse of X.

(iii) XGX' is invariant to G.

(iv) XGX' is symmetric, whether G is symmetric or not.

24/5/19(m)

[This question paper contains 7 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **2277** **IC**

Unique Paper Code : 32371208

Name of the Course : **B.Sc. (Hons.) Statistics**

Name of the Paper : **Probability & Probability Distributions**

Semester : II

Time : 3 Hours **Maximum Marks : 75**

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
 - (b) Attempt **six** questions in all.
 - (c) Question **No.1** is compulsory. Attempt **five** more questions, selecting at least **two** from each Section.
 - (d) Use of simple calculators is allowed.
1. (a) State **true** or **false** : 1×7=7
- (i) If $\varphi_{X+Y}(t) = \varphi_X(t) \cdot \varphi_Y(t)$ then X and Y are independent.
 - (ii) For a standard Laplace distribution, mean = 0, variance = 1.

P.T.O.

- (iii) $P(X > Y) = 1 \Rightarrow E(X) \geq E(Y)$
- (iv) If X & Y are independent then $E(XY+Y+1) = E(X+1)E(Y) = 0$
- (v) If $X \sim B(10, \frac{1}{2})$, $Y \sim B(15, \frac{1}{2})$ then $X + Y \sim B(25, \frac{1}{2})$
- (vi) In a uniform distribution, quartiles are equispaced.
- (vii) There cannot be a random variable X for which $M_x(t) = \frac{1}{(1-t)}$
- (b) Given the characteristic function $\phi_x(t) = e^{3it-8t^2}$, find the characteristic function of $Z = \frac{1}{4}(X-3)$, identify the distribution, hence find mean and variance of Z .
- (c) Name **two** distributions which are always positively skewed. 2
- (d) If $X \sim B(10, 3/5)$, then find
- (i) mode of X and 2
- (ii) the distribution of $Y = 10-x$. 2

- (e) Let X and Y have the joint probability distribution with $p(-1, 0) = 0$, $p(-1, 1) = 1/4$, $p(0, 0) = 1/6$, $p(0, 1) = 0$, $p(1, 0) = 1/12$ and $p(1, 1) = 1/2$. Show that $\text{cov}(X, Y) = 0$. 2

Section - A

2. (a) A random variable X has the probability law
- $$dF(x) = \frac{x}{b^2} e^{-x/b} dx; \quad 0 \leq x < \infty.$$
- Find mean, quartiles and standard deviation of X . Also check the skewness of the distribution. 6
- (b) Consider the random variable X with probability function $f(x) = \frac{3x^2}{2}; -1 < x < 1$. Find the p. d. f. of (i) $Y = |X|$ and (ii) $Y = X^2$. 6
3. (a) A coin is tossed 4 times. Let X denote the number of times a head is followed immediately by a tail. Find the probability distribution and moment generating function. Hence find the mean and variance of X . 6

(b) The joint p. d. f. of X and Y is given by :

6

$$f(x,y) = 24y(1-x-y) \quad ; \quad x > 0, y > 0, x+y < 1.$$

Find :

- (i) Marginal p. d. f. of x
 - (ii) Conditional probability distribution of $(X/Y = y)$
 - (iii) $P(X + Y < 1/2)$
4. (a) Let X be a continuous random variable with p. d. f.

$$f(x) = \begin{cases} kx; & 0 \leq x \leq 1 \\ k; & 1 \leq x \leq 2 \\ -kx + 3k; & 2 \leq x \leq 3 \\ 0; & \text{otherwise} \end{cases}$$

Determine :

- (i) The constant k
- (ii) The cumulative distribution function F(x) of X. Hence

$$P\left(X \leq \frac{1}{2} \mid \frac{1}{3} \leq X \leq 1.5\right).$$

4

(iii) The probability that exactly one of x_1 and x_2 is larger than 2, If x_1 and x_2 are two independent observation on x.

(b) Find the moment generating function of a random variable whose moments are

$$\mu_r' = (r+2)!2^r, \quad r = 1, 2, \dots \quad (6,6)$$

Section - B

5. (a) Find the mean deviation about mean of the binomial distribution with parameters n and p. 6

(b) Let $X \sim N(\mu, \sigma^2)$. Find its m. g. f. $M_X(t)$. Hence find the first four cumulants. 6

6. (a) Suppose the random variable $X \sim U(0, 1)$ and

$$PY = y \mid X = x = \binom{n}{y} \cdot x^y (1-x)^{(n-y)}; \quad y = 0, 1, 2, \dots$$

n. Find :

- (i) The probability mass function (pmf) of Y
- (ii) $E(Y/X=x)$ and hence $E(Y)$.

5

P.T.O.

- (b) If X and Y are two independent random variables with common exponential distribution, then find the p. d. f. of (i) $X+Y$ (ii) $X-Y$. Also identify the distribution in both cases (i) and (ii)

6

7. (a) Obtain Poisson distribution as a limiting case of Negative Binomial Distribution.

6

- (b) Show that mean value of positive square root

$$\frac{\Gamma\left(n+\frac{1}{2}\right)}{\sqrt{\lambda}\Gamma(n)}$$

of a Gamma (λ, n) variate is

Hence prove that mean deviation of a $N(\mu, \sigma^2)$ variate from its mean is $\sigma\sqrt{2/\pi}$.

(using $X \sim N(\mu, \sigma^2)$ then $\frac{1}{2}\left(\frac{X-\mu}{\sigma}\right)^2 \sim$ Gamma

$\left(\frac{1}{2}\right)$ variate).

6

8. (a) When is a random variable said to follow hypergeometric distribution? Obtain its probability function, mean and variance.

6

6

- (b) The random variable X has mean M and standard deviation s . If $Y = \log_e X \sim N(\mu, \sigma^2)$, then prove that :

6

$$(i) M = e^{\left(\mu + \frac{1}{2}\sigma^2\right)}$$

$$(ii) 1 + \frac{s^2}{M^2} = e^{\sigma^2}$$

7

600