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10ME71

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Engineering Economy

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain law of returns, giving reasons for increasing returns, constant returns and decreasing returns. **(10 Marks)**

b. Find the future sum of Rs.10,000 after one year at an interest rate of 10% if the interest is compounded : annually, half yearly, quarterly and monthly. **(10 Marks)**

2 a. Initial investment, annual revenue and salvage value of two machines are 45,000 and 70,000, 15,000 and 20,000 ; 6,500 and 9000 respectively. Both have 7 years useful life. If nominal interest rate is 14%. Select the machine using present worth method. **(10 Marks)**

b. Select the better alternative of the following if i = 9.75% compounded annually :

Year	0 (Rs.)	1 (Rs.)	2(Rs.)	3(RS.)	4(Rs.)
Alt X	–2,50,000	1,00,000	1,00,000	1,00,000	1,00,000
Alt Y	–3,00,000	1,40,000	1,10,000	90,000	1,00,000

(10 Marks)

3 a. For equivalent annual worth (EAW or AEW) comparison of alternatives having unequal lives, is it necessary to take LCM of their life? Why not? **(10 Marks)**

b. The following alternatives can perform the same function. Rank their with i = 12%.

Alt	First cost Rs	Life years	Salvage value Rs.	Annual cost Rs.
A	6000	6	2000	800
B	3000	3	1000	1000
C	2000	3	Nil	1200

Use equivalent annual cost method. **(10 Marks)**

4 a. Explain the terms : minimum acceptable return, internal rate return, external rate of return and depreciation. **(10 Marks)**

b. For an asset whose initial cost is Rs.10,000 and salvage value at the eight year is 2000 determine the depreciation amount for each year. Also find book value for each year using straight line method of depreciation. **(10 Marks)**

PART – B

5 a. Explain the terms : direct material cost, direct labour cost, overheads, total cost. **(10 Marks)**

b. The various cost components for production of 30,000 units per annum are given : direct materials Rs. 6/- per unit, direct labour Rs 5/- per unit, fixed over heads Rs. 60,000 variable over heads Rs.2.50 per unit. Find the total cost and total cost/unit. **(10 Marks)**

6 a. List the items that appear in a profit and loss account. Present them in a logical order, ending with net project. **(10 Marks)**

b. The following details as on 31/3/2014 are available for XYZ Co. Prepare a balance sheet as on 31/3/2014

Fixed assets 58,125, Current Liabilities 45,050, Reserves and Surplus 47,550, Loans 25,180, Investments 2,635, Cash 6,555, Share Capital 45,075, Provision for Divided 3,525, Secured Loans 25,075, Debtors 26,555, Unsecured Loans 27,550, Stocks 77,050, Provision for Taxation 275. **(10 Marks)**

7 a. List profitability ratios and explain any two. **(10 Marks)**

b. List activity ratios and explain any two. **(10 Marks)**

8 a. For a budget to result in profit, what essentials are necessary? Explain any one of them. **(10 Marks)**

b. What is bench marking? List seven steps in bench marking with brief description. **(10 Marks)**

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10ME72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Mechanical Vibrations

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define : (i) Resonance
(ii) Phase difference
(iii) Natural frequency **(06 Marks)**

b. Explain the concept of vibration with Simple Harmonic Motion. **(04 Marks)**

c. Represent the periodic motions given in the Fig.Q1(c) by harmonic series:

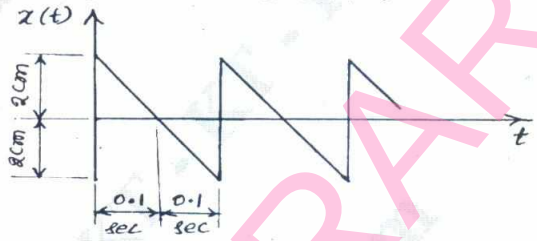

Fig.Q1(c) **(10 Marks)**

2 a. Derive natural frequency of spring mass system considering the effect of mass of spring. **(10 Marks)**

b. Determine the natural frequency of the vertical bar assuming the mass of the bar as 'm' with two unstretched springs as shown in the Fig.Q2(b). Is there any limitation on the value of 'K'. **(10 Marks)**

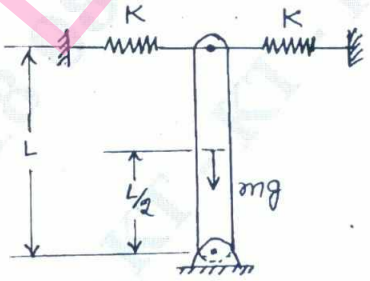

Fig.Q2(b)

3 a. Set up the differential equation for a spring mass damper system and obtain complete solution for over damped condition. **(10 Marks)**

b. The disc of a torsional pendulum has a moment of inertia of 600 kg-cm^2 and is immersed in a viscous fluid. The brass shaft, which carries the disc is attached to it. When the pendulum vibrates, the observed amplitudes on the same side of the rest position for successive cycles are 9°, 6° and 4°. Determine (i) Logarithmic decrement (ii) Damping torque/unit velocity (iii) The periodic time of vibration (iv) The frequency if the disc is removed from the fluid. Assume for the brass shaft, G = 4.4×10^{10} N/m^2, d = 0.10m, l = 0.40 m, moment of inertia of disc = 0.06 kg-m^2. **(10 Marks)**

4 a. Explain briefly the excitation due to rotating unbalance and reciprocating unbalance. **(10 Marks)**

b. A weight of 54 N is suspended by a spring with a stiffness of 1100 N/m. It is forced to vibrate by a harmonic force of 5 N. Assuming a viscous damping of 77 N-s/m, find (i) Amplitude at resonance (ii) Phase angle at resonance (iii) Damped natural frequency (iv) Frequency at which maximum amplitude occurs (v) Peak amplitude. **(10 Marks)**

PART – B

5 a. Derive an expression for deflection of the shaft with a disc at the centre with an eccentricity from the shaft axis neglecting damping. **(10 Marks)**

b. A vertical shaft 14 mm diameter rotates in long bearings and a disc of mass 16 kg is attached to the mid span of the shaft. The snap of the shaft between the bearings is 1.2m. The mass centre of the disc is 0.4 mm from the axis of the shaft. Neglecting the mass of the shaft and taking the deflection as for beam fixed at both ends, determine the critical speed of rotation. Also determine the range of speed over which the stress in the shaft due to bending will not exceed 70×10^6 N/m^2. Take E = 200 GN/m^2. **(10 Marks)**

6 a. Derive expressions for natural frequencies of the system shown in the Fig.Q6(a) and sketch the mode shapes. **(12 Marks)**

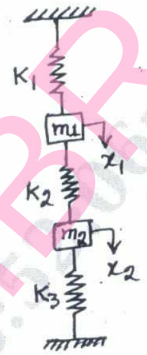

Fig.Q6(a)

b. A motor drives a centrifugal pump through gearing, the pump speed being one-third of the motor. The shaft from the motor to the pinion 60mm diameter and 300 mm long. The moment of inertia of the motor is 400 kg-m^2. The impeller shaft is 100 mm diameter and 600mm long. The moment of inertia of the impeller is 1500 kg-m^2. Neglecting the inertia of the gears and the shaft determine the frequency of torsional vibration of the system. The modulus of rigidity of the shaft material is 80 GN/m^2. **(08 Marks)**

7 a. A simply supported beam subjected to UDL and concentrated loads as shown in the Fig.Q7(a). Determine the fundamental natural frequency of transverse vibration by Dunkerley's method. Take diameter of the shaft as 180 mm and E = 2×10^{11} N/m^2. **(10 Marks)**

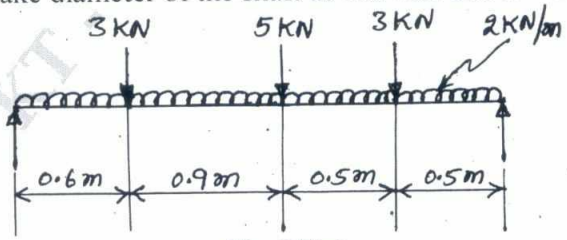

Fig.Q7(a)

b. Determine the natural frequency of the system shown in the Fig.Q7(b) by using Rayleigh's method. **(10 Marks)**

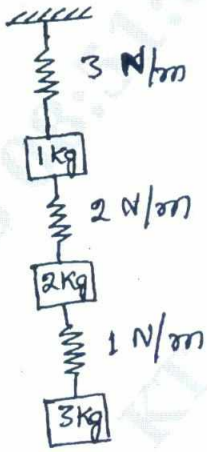

Fig.Q7(b) **(10 Marks)**

8 a. Explain signal analysis and dynamic testing of machines and structures. **(10 Marks)**

b. Explain experimental modal analysis. **(10 Marks)**

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10ME73

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Hydraulics and Pneumatics

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO full questions from each part.***

PART – A

1 a. What are the advantages and limitations of a hydraulic system? **(06 Marks)**

b. Explain the working of axial piston pump with a neat sketch. **(08 Marks)**

c. A gear pump has 75mm outside diameter, 50mm inside diameter and 25mm width. If the volumetric efficiency is 90%, what is the corresponding actual flow rate? The pump speed is 1000rpm. **(06 Marks)**

2 a. Explain with a neat sketch the working of a single acting cylinder. **(06 Marks)**

b. With a neat sketch, explain first class lever system used with hydraulic cylinders to drive load. **(08 Marks)**

c. A hydraulic motor has a displacement of $130cm^3$ and operates with a pressure of 105 bar and speed of 2000rpm. If the actual flow rate consumed by the motor is 0.005 m^3/s and the actual torque delivered by the motor is 200 N-m find i) η_v ii) η_m iii) η_o. **(06 Marks)**

3 a. Explain the working of shuffle valve with a sketch. **(06 Marks)**

b. Explain the operation of sequence valve with a neat sketch. **(08 Marks)**

c. Give the symbol for the following:
Pilot operated check valve, pressure sequence valve, pressure reducing valve, variable flow control valve four way three position with float neutral, four way three position with regenerative neutral? **(06 Marks)**

4 a. Explain the control of double acting cylinder with a sketch. **(06 Marks)**

b. Explain hydraulic cylinder sequencing circuit with a sketch. **(08 Marks)**

c. Explain the difference between meter-in and meter-out circuit with a sketch. **(06 Marks)**

PART – B

5 a. Explain any six service properties of hydraulic fluids. **(06 Marks)**

b. Explain the reservoir system with a neat sketch. **(08 Marks)**

c. Explain the general types of hydraulic fluids. **(06 Marks)**

6 a. Give the classification of air cylinders. **(06 Marks)**

b. Explain the structure of pneumatic control system with a neat sketch. **(08 Marks)**

c. Explain the rodless cylinder with a neat sketch. **(06 Marks)**

7 a. Explain the sliding spool type of DCV with a sketch. **(06 Marks)**

b. Explain with a suitable circuit diagram application of the memory valve. **(06 Marks)**

c. With a neat sketch, explain how following functions are generated in pneumatic system i) AND function ii) OR function. **(08 Marks)**

8 a. Explain displacement step diagram for stamping operation. **(06 Marks)**

b. Explain use of relay with a sketch. **(06 Marks)**

c. Explain air filter for pneumatic system with a neat sketch. **(08 Marks)**

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10ME74

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Operations Research

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Use of normal distribution chart is permitted.

PART – A

1 a. List and explain different phases of operations research. **(06 Marks)**

b. Solve the following LP problem graphically :

Minimize $z = 2x_1 + 1.5x_2$

Subject to $x_1 + x_2 = 50$

$0.15x_1 - 0.05x_2 \geq 0$

$0.02x_1 - 0.03x_2 \geq 0$

$-0.05x_1 + 0.15x_2 \geq 0$

$x_1, x_2 \geq 0.$ **(14 Marks)**

2 a. Solve the following LPP by Big-M method :

Minimum $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$

$x_1, x_2 \geq 0.$ **(15 Marks)**

b. Write the dual of the following LPP :

maximum $Z = 3x_1 + 2x_2 + 1x_3$

subject to $5x_1 + 2x_2 + 3x_3 = 6$

$2x_1 + 3x_2 + x_3 \geq 2$

$x_1 + 2x_2 + 6x_3 = 5$

$x_1, x_2, x_3 \geq 0.$ **(05 Marks)**

3 a. Obtain basic feasible solution for the following transportation problem by

i) North–West corner rule
ii) Matrix minima method
iii) Penalty method. **(10 Marks)**

To / Form	1	2	3	4	5	Capacity
A	5	8	6	6	3	800
B	4	7	7	6	5	500
C	8	4	4	6	4	900
Demand	400	400	500	400	800	

b. Solve the travelling salesman problem for the following data :

$C_{12} = 20$ $C_{13} = 4$ $C_{14} = 10$ $C_{35} = 6$ $C_{23} = 5$ $C_{25} = 10$ $C_{34} = 6$ $C_{54} = 20$

Where $C_{ij} = C_{ji}$ and there is no route between cities i and j the values for C_{ij} is not given. **(10 Marks)**

4 Solve the following integer programming problem by Gomory cutting plane method :
Maximum $Z = 3x_1 + 4x_2$
Subject to $2x_1 + x_2 \leq 6$
$2x_1 + 3x_2 \leq 9$
$x_1, x_2 \geq 0$ and integers. **(20 Marks)**

PART – B

5 a. Explain the Fulkerson rule of numbering of nodes with the help of an example. **(05 Marks)**

b. A project consists of the activities as given in the table below :

Activity	Immediate predecessor	Time in weeks		
		t_0	t_p	t_ℓ
A	–	1	7	1
B	A	1	7	4
C	–	2	8	2
D	B, C	1	1	1
E	C	2	14	5
F	A, C	2	8	5
G	D	3	15	6

i) Draw the project network and find the critical path. **(10 Marks)**
ii) What is the probability of completing the project in 17 weeks? **(05 Marks)**

6 a. Briefly explain the characteristics of queue. **(06 Marks)**

b. A barbar runs a one-man shop. Customers arrive on FCFS basis follows a Poisson pattern with a mean arrival rate of 30/hour. The barbar's service time appears to be exponentially distributed with a mean of 1.5 minute. Determine :
i) The expected number of customers in the shop
ii) The expected number of customers waiting for service
iii) The average time a customer should expect to wait for service
iv) The probability that the service is idle. **(14 Marks)**

7 a. Briefly explain the following terms with reference to game theory :
i) Saddle point ii) Pure strategy iii) Pay-off iv) Mixed strategy. **(08 Marks)**

b. Two players A and B playing matching coins game in which each player has 4 coins ; a 1 Rs, a 2 Rs., a 5 Rs and a 10 Rs. Each player selects a coin without the knowledge of others choice. If the sum of the coins amount is an odd, player–A wins player–B's coin. If the sum the coins amount is even, B wins A's coin. Formulate this problem as game theory problem and find the optimal strategies for each player and game value. **(12 Marks)**

8 a. Briefly explain the Johnson algorithm for finding the sequence for 'n' jobs through 2 machines. **(04 Marks)**

b. Find the sequence that minimizes the total elapsed time required to complete the following tasks :

Task	A	B	C	D	E	F	G
Time on M/c-1(Hrs)	3	8	7	4	9	8	7
Time on M/c-2(Hrs)	4	3	2	5	1	4	3
Time on M/c-3(Hrs)	6	7	5	11	5	6	12

Also find the percentage of utilization and idle time of each machine. **(16 Marks)**

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10ME754

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Non – Conventional Energy Sources

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Write short notes on Oil shale and Tar sands. **(06 Marks)**

b. List out the advantages and disadvantages of solar energy conversion. **(06 Marks)**

c. Discuss the India's electricity production from commercial and non – commercial sources of energy with help of recent statistics. **(08 Marks)**

2 a. Explain the working principle of Pyrheliometer with neat sketch. **(10 Marks)**

b. Define the following terms : i) Solar constant ii) Direct radiation iii) Global radiation iv) Declination angle v) Day length. **(10 Marks)**

3 a. Write the expression for flux on tilted surface and mention its components. **(04 Marks)**

b. Write short notes on : i) Latent heat storage ii) Solar pond iii) Paraboloid dish solar collector iv) Solar air heater v) Parabolic Trough collector. **(10 Marks)**

c. List out the operational problems of solar pond any six. **(06 Marks)**

4 a. Calculate the overall loss coefficient for a flat plate collector with two glass covers. Given the following data : **(15 Marks)**

Size of the absorber plate	: 1.90m × 0.90m
Spacing between plate and first glass cover	: 4cm
Spacing between first and second glass cover	: 4 cm
Plate emissivity	: 0.92
Glass cover emissivity	: 0.88
Collector tilt	: 20^0
Mean plate temperature	: 70^0C
Ambient air temperature	: 24^0C
Wind speed	: 2.5 m/s
Back insulation thickness	: 8 cm
Side insulation thickness	: 4 cm
Thermal conductivity of insulation	: 0.05 w/m-K

b. List out any five parameters, effects on performance of liquid flat – plate collector. **(05 Marks)**

PART – B

5 a. Describe with neat sketch a photovoltaic water pumping system. **(10 Marks)**

b. Define the following terms :
i) Power co-efficient ii) Lift co-efficient iii) Drag co-efficient iv) Tip speed v) Solidity. **(10 Marks)**

6 a. Explain the working principle of a closed Rankine cycle OTEC system, with neat sketch and thermodynamic representation. **(10 Marks)**

b. Explain the working principle of oscillating water column wave energy conversion system, with neat sketch. **(08 Marks)**

c. List out any four geothermal power plant in the world. **(02 Marks)**

7 a. Write short notes on Photo Synthesis. **(02 Marks)**

b. Classify the various routes of Biomass conversion. Explain any one in detail. **(08 Marks)**

c. Explain the construction and working principle of Biogas plant [KVIC model], with neat sketch. **(10 Marks)**

8 a. What are the properties of Hydrogen fuel? **(04 Marks)**

b. List out the various routes of Hydrogen production and explain any one routes in detail. **(08 Marks)**

c. What are the applications of hydrogen? Explain use of hydrogen in Internal combustion engine. **(08 Marks)**

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10ME769

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

Product Life Cycle Management

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define PLM and explain phases of PLM. **(10 Marks)**

b. Explain different threads of PLM. **(10 Marks)**

2 a. List and explain the characteristics of PLM. **(10 Marks)**

b. What are elements of PLM? **(05 Marks)**

c. Explain any four internal drivers of PLM. **(05 Marks)**

3 a. Define PDM system. Explain the importance and reasons for implementing them in organization. **(10 Marks)**

b. Explain: (i) Check-in (ii) Check-out (iii) Meta data (iv) Work flow. **(10 Marks)**

4 a. Write a short note on the following:
i) Start and smart part
ii) Prototype development
iii) Virtual testing **(15 Marks)**

b. What is collaborative product development? Briefly explain. **(05 Marks)**

PART – B

5 a. Explain the process of creation of 3DXML and CAD drawing using CAD software. **(10 Marks)**

b. How an acrobat 3D document is created? Explain the different steps involved in it. **(10 Marks)**

6 a. Briefly explain the following:
i) Publication
ii) Parameters
iii) Formula
iv) Configuration **(10 Marks)**

b. Explain the process of parameterization of design in brief. **(10 Marks)**

7 a. What is digital manufacturing? Explain the concepts of manufacturing the first component. **(10 Marks)**

b. Write short note on the following:
i) Virtual learning curve
ii) Production planning **(10 Marks)**

8 a. What is PLM strategy? What are the PLM implementation strategies? **(10 Marks)**

b. Explain:
i) Impact of strategy
ii) Assessment of current system. **(10 Marks)**

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