

SECTION-II

Q4) Solve any two:

[18]

- a) List computer applications & explain any three in details.
- b) i) Convert decimal number into hexadecimal
1) $(674325)_{10}$ 2) $(98665.214)_{10}$
ii) Convert Binary number into hexadecimal
1) $(1011110011)_2$ 2) $(111111.1111)_2$
- c) Explain algorithm and flow chart for computer programming using suitable language.

Q5) Solve any two:

[16]

- a) Explain following UNIX/LINUX command with an example.
 - i) LS ii) CD
 - iii) CAT iv) MKDIR
 - v) PWD vi) CP
- b) Explain in brief Assembler, interpreter and compiler.
- c) Write short note on computer network.

Q6) Solve any two:

[16]

- a) Write short note on Internet WWW.
- b) Write short note on applications of Computer.
- c) Explain low level language and high level language in details.



SV-5

Total No. of Pages : 2

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F.E. (All Branches) (Part-I) (Semester - I & II) (Revised)

Examination, May - 2018

**FUNDAMENTALS OF ELECTRONICS AND
COMPUTERS**

Sub. Code : 59184

Day and Date : Saturday, 05 - 05 - 2018

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figure to right indicates full marks.
 - 3) Assume suitable data if necessary.

SECTION-I

Q1) Solve any two: [18]

- a) Explain FW rectifier using centre tap transformer with necessary waveforms.
- b) What is De-multiplexer? Explain 1:8 De-mux with truth table.
- c) Write short note on displacement transducers.

Q2) Solve any two: [16]

- a) What is the need of biasing? Explain any one type of biasing circuit in detail.
- b) Write short note on strain gauge transducer.
- c) Explain J - K flip flop in detail.

Q3) Solve any two: [16]

- a) Explain RC coupled Ce amplifier with suitable diagrams.
- b) For CE configuration explain saturation, active and cut-off regions with I/P and O/P characteristics.
- c) Explain any one type of displacement transducer.

P.T.O.



- Q4) a) Explain with neat sketch working of vapour absorption refrigeration system. [9]
- b) What are the desirable properties of a refrigerant? [9]

SECTION - II

- Q5) a) Explain flat plate collector and concentric collector with help of neat sketch. [8]
- b) What is priming? Explain the working of reciprocating pump with neat sketch. [8]

- Q6) a) A leather belt transmits 30 Kw from a pulley 750 mm in diameter running at 500 rpm. The angle of contact is 160° and coefficient surfaces are 0.3. If the permissible stress in the belt is not to exceed 2 MN/m², determine the belt cross-section area. [8]

- b) Explain with neat sketch working of Kaplan Turbine. [8]

- Q7) a) What are the different of metal removing process? Explain milling process with neat sketch. [8]

- b) Explain Sand Casting Process in detail with neat sketch. [8]

- Q8) Write short note on [18]

- i) Fuel Cell
- ii) Chain Drive
- iii) Impulse Turbine



Seat No.	
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F.E. (All) Examination, May - 2018
BASIC MECHANICAL ENGINEERING
Sub. Code : 59186

Day and Date : Thursday, 17 - 05 - 2018

Total Marks : 100

Time : 10.00 a.m. to 01.00 p.m.

- Instructions :
- 1) Answer any 3 questions from each section.
 - 2) Figures to the right side indicate marks.
 - 3) Draw the diagram wherever necessary.
 - 4) Assume suitable data if necessary.

SECTION - I

- Q1)** a) Define heat and work. State and explain different forms of work. [8]
 b) Define Intensive and Extensive property. Classify the following quantities whether they are intensive or extensive by specifying reasons, [8]
- i) Pressure
 - ii) Energy
 - iii) Temperature
 - iv) Density
 - v) Enthalpy
- Q2)** a) A steam turbine operates under steady flow conditions receiving steam at the following state. Pressure 20 bar, internal energy 3000 KJ/Kg, specific volume 0.12 m³/Kg and velocity 120 m/s. The exhaust of steam from the turbine is at 0.1 bar with internal energy 2200 KJ/Kg, specific volume 15 m³/Kg and velocity 310 m/s. The intake is 5 m above the exhaust. The turbine develops 45 Kw and heat loss over the surface of turbine is 30 KJ/Kg. Determine the steam flow rate through the turbine. [8]
 b) What is PMM-I and PMM-II and why it is impossible. [8]
- Q3)** a) Compare SI and CI engine. [8]
 b) With neat sketch explain construction and working of four strokes CI engine. [8]

P.T.O



- Q3) a) What is meant by stoichiometric combustion? Give reasons for incomplete combustion and how to overcome. [8]
b) Distinguish between SI and CI engines. [8]
- Q4) a) Define following terms [8]
i) Relative Humidity
ii) Dry Bulb Temperature
iii) Wet Bulb Temperature
iv) Dew Point Temperature
b) Explain with neat sketch Window Air Conditioner. [8]

SECTION - II

- Q5) a) Explain with neat sketch construction and working of Hydro-Electric Power Plant. [8]
b) Differentiate between Renewable and Non-Renewable energy sources. [4]
c) Draw neat sketch of Bio-Gas Plant. [4]
- Q6) a) Classify Pumps and explain Centrifugal Pump with neat sketch. [8]
b) Derive expression for length of Cross Belt Drive. [8]
- Q7) a) What are the different metal joining processes? Explain any two processes with neat sketch. [8]
b) Explain metal removing processes and its applications. [8]
- Q8) Write short notes on : [18]
a) Sand Casting
b) Oldham Coupling
c) Photovoltaic Cell



Seat No.	
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F.E. (All Branches) (Semester I & II) Examination, December - 2018**BASIC MECHANICAL ENGINEERING****Sub. Code : 59186****Day and Date : Friday, 07 - 12 - 2018****Total Marks : 100****Time : 02.30 p.m. to 05.30 p.m.**

- Instructions :**
- 1) Attempt any three questions from each section.
 - 2) Figures to the right indicate full marks.

SECTION - I

- Q1) a)** Differentiate between Macroscopic and Microscopic view in thermodynamics study. [4]
- b)** Air flows steadily at the rate of 25Kg/ min through an air compressor. At entrance section velocity of 7 m/s, the pressure is 1.5 bar and the specific volume is 0.85m³/kg. The corresponding values at the exit section are 5 m/s, 7.5 bar and 0.175m³/Kg respectively. The internal energy of air increases by 90KJ/Kg across the compressor. Cooling water in the compressor jackets absorbs [10]
- i) Heat from the air at the rate 3700 KJ/min.
 - ii) Compute the rate of shaft work input to the air in Kw.
Find the ratio of input pipe diameter to the outlet pipe.
- c)** Explain the concept of different types system. [4]
- Q2) a)** A nozzle receives air at a velocity of 60m/s. The enthalpy of incoming air is 3100 KJ/Kg and that of the outgoing air is 2800 KJ/Kg. Determine the velocity of exit air assuming no heat and work loss. Also find out the specific volume of outgoing air if the discharge area of nozzle is 20cm², and rate of discharge as 3 Kg/sec. [8]
- b)** Define heat and work. State and explain different forms of work. [8]

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Total No. of Pages : 2

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F.E. (All) Examination, May - 2018
BASIC MECHANICAL ENGINEERING
Sub. Code : 59186

Day and Date : Thursday, 17 - 05 - 2018

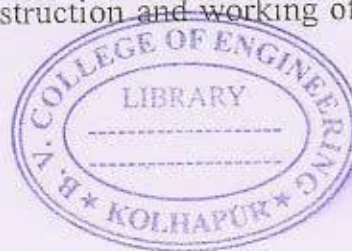
Total Marks : 100

Time : 10.00 a.m. to 01.00 p.m.

- Instructions :
- 1) Answer any 3 questions from each section.
 - 2) Figures to the right side indicate marks.
 - 3) Draw the diagram wherever necessary.
 - 4) Assume suitable data if necessary.

SECTION - I

- Q1)** a) Define heat and work. State and explain different forms of work. [8]
b) Define Intensive and Extensive property. Classify the following quantities whether they are intensive or extensive by specifying reasons, [8]
- i) Pressure
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 - iii) Temperature
 - iv) Density
 - v) Enthalpy
- Q2)** a) A steam turbine operates under steady flow conditions receiving steam at the following state. Pressure 20 bar, internal energy 3000 KJ/Kg, specific volume 0.12 m³/Kg and velocity 120 m/s. The exhaust of steam from the turbine is at 0.1 bar with internal energy 2200 KJ/Kg, specific volume 15 m³/Kg and velocity 310 m/s. The intake is 5 m above the exhaust. The turbine develops 45 Kw and heat loss over the surface of turbine is 30 KJ/Kg. Determine the steam flow rate through the turbine. [8]
b) What is PMM-I and PMM-II and why it is impossible. [8]
- Q3)** a) Compare SI and CI engine. [8]
b) With neat sketch explain construction and working of four strokes CI engine. [8]



P.T.O

- Q4) a) Explain with neat sketch working of vapour absorption refrigeration system. [9]
- b) What are the desirable properties of a refrigerant? [9]

SECTION - II

- Q5) a) Explain flat plate collector and concentric collector with help of neat sketch. [8]
- b) What is priming? Explain the working of reciprocating pump with neat sketch. [8]
- Q6) a) A leather belt transmits 30 Kw from a pulley 750 mm in diameter running at 500 rpm. The angle of contact is 160° and coefficient surfaces are 0.3. If the permissible stress in the belt is not to exceed 2 MN/m², determine the belt cross-section area. [8]
- b) Explain with neat sketch working of Kaplan Turbine. [8]
- Q7) a) What are the different of metal removing process? Explain milling process with neat sketch. [8]
- b) Explain Sand Casting Process in detail with neat sketch. [8]
- Q8) Write short note on [18]
- i) Fuel Cell
 - ii) Chain Drive
 - iii) Impulse Turbine



SV-3

Total No. of Pages : 3

Seat No.	
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F.E. (All Branches) (Semester-I&II) (Revised)

Examination, April - 2018

ENGINEERING CHEMISTRY

Sub. Code : 59183

Day and Date : Saturday, 28-04-2018

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Assume suitable data wherever necessary.
 - 3) Draw neat labelled diagram wherever necessary.
 - 4) Figures to the right indicate full marks.

SECTION-I

Q1) a) A sample of water on analysis was found to contain the following salts: [8]

Salt	Amount of salt in mg/lit.	Mol. Wt.
$\text{Ca}(\text{HCO}_3)_2$	34.1	162
$\text{Mg}(\text{HCO}_3)_2$	44.0	146
CaCl_2	27.0	111
CaSO_4	26.0	136
KCl	5.7	70.5

Calculate temporary, permanent and total hardness of sample in degree clark.

- b) Solve any TWO of the following: 10M(Each 5M)
- i) What is pH? Explain construction of glass electrode with schematic diagram.
 - ii) Explain Alkalinity of water in details.
 - iii) Give the properties and applications of urea formaldehyde resin.



P.T.O.

SV-3

- 2) a) Explain the construction and working of gas chromatography with suitable diagram. [6]
- b) Solve any TWO of the following. 10M(Each 5M)
- What is scale and sludge formation? Explain the disadvantage and prevention of scale formation.
 - Define polymers. Explain condensation polymerization reactions with example.
 - Give different synthesis methods of nano materials.

3) Solve any FOUR of the following. 16M(Each 4M)

- Write the advantages of Instrumental methods of analysis.
- Give the important applications of composites.
- Explain reverse osmosis method for purification of water.
- State and explain of Beer's- Lambert's law.
- What is conducting polymer? Explain its mechanism with suitable examples.
- Write note on dissolved Oxygen of water.

SECTION-II

4) a) The following observations were made in Boy's gas calorimeter experiment: [8]

- Volume of gas used = 0.086 m^3 at STP
- Weight of water circulated = 44.1 Kg
- Temperature of inlet water = 27.4°C
- Temperature of outlet water = 38.7°C
- Mass of condensate = 0.037 Kg

Calculate the gross and net calorific values of gas sample in KJ/m^3 .

(Take heat liberated in condensing water vapors cooling the condensate is 584 K cal/kg .)

SV-3

- b) Solve any TWO of the following. 10M(Each 5M)
- Explain the factors influencing on the rate of corrosion.
 - Give composition, properties and uses of medium carbon steel.
 - Explain various characteristics of good fuels.

5) a) Explain construction & working of bomb calorimeter with schematic diagram. [6]

- b) Attempt any two questions. 10M(Each 5M)
- What is an alloy? Explain the purposes of alloying with suitable example.
 - What are metallic coatings? Explain tinning process for the prevention of corrosion.
 - Explain with suitable diagram cathodic protection to prevent corrosion.

6) Answer of the following four questions: 16M(Each 4M)

- Explain mechanism of oxidation corrosion with suitable diagram.
- State composition, properties and uses of Alnico.
- How liquid fuel is more advantages than solid fuel.
- Give properties and uses of Nichrome.
- Write note on metal spraying.
- What are fuel cells? Explain the classification of fuel cells based on temperature.



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Total No. of Pages : 3

Seat
No.

F.E. (All Branches) (Semester - I&II) (Revised)
Examination, May - 2018
BASIC ELECTRICAL ENGINEERING
Sub. Code: 59178

Day and Date : Thursday, 03 - 05 - 2018

Total Marks : 100

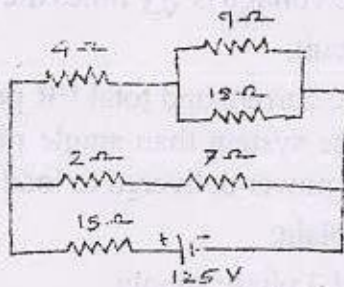
Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Draw neat labeled diagrams as a part of explanation.
 - 4) In case of missing data, assume suitable value. State it clearly.

Q1) Answer any Two:

[2 × 9 = 18]

- a) By mesh analysis or nodal analysis, for the given network, find:
- i) Current in 15 ohm resistor.
 - ii) Voltage across 18 ohm.
 - iii) Power dissipated in 7 ohm resistor.



- b) Explain magnetic leakage and fringing in a magnetic circuit? State how they are minimized.
- c) A water heater immersed in 1Kg water has heating element of 250 ohm & supply voltage is 230V. Calculate rise in temperature of water in 5 minutes. Assume Specific Heat = 4186 J/Kg.Deg K. Assume 70% efficiency.



P.T.O.

SV - 4

2) Answer any two:

[2 × 9 = 18]

- Prove that average power consumed by ac circuit is $V I \cos \Phi$ when connected to sinusoidal AC voltage $V_m \sin \omega t$ and conducting current $I_m \sin (\omega t - \Phi)$.
- Two impedances $Z_1 = 2 + j 4$ and $Z_2 = 3 + j 5$ are connected in parallel across 100 $\angle 0^\circ$ V, AC supply. Calculate :
 - Total current
 - Total Impedance
 - Power factor
- A resistance of 100 ohm, inductance 1 Henry and capacitor 5 micro farad are connected in series across voltage $V = 141.41 \sin 314.14 t$. Calculate Impedance, rms value of voltage, rms value of current, power factor, Active power, Reactive power.

3) Answer any two:

[2 × 7 = 14]

- Draw and explain operating principle of LED lamp. Why LED lamps are now a days replacing conventional lamps?
- Compare rewirable Fuse and MCB. Why MCB is preferred over Fuse?
- State the methods of earthing used in electrical system. What is risk involved without proper earthing, explain with the help of neat diagram.

4) Answer any two:

[2 × 7 = 14]

- Prove that line voltage is $\sqrt{3}$ times the phase voltage in a balanced delta connected circuit.
- Prove that line current and total $I^2 R$ power loss in transmission lines is less in 3 phase system than single phase system. (Assume same line voltage, same power delivered to load with same power factor).
- Define and explain:
 - Balanced 3 phase supply
 - Phase sequence
 - Balanced 3 phase load

SV - 4

[2 × 9 = 18]

5) Answer any two:

- Compare construction of projecting pole rotor and smooth cylindrical rotor of alternator. Which rotor is suitable if the prime mover is a water turbine?
- Describe the core and windings of
 - Shell type transformer
 - Core type transformer
- Find the emf induced per turn in a transformer operating on 200V, 50 Hz ac supply. Peak value of magnetic flux in the core is 2mWb. If it is a step down transformer with turns ratio $\frac{1}{2}$. Find the secondary winding turns.

6) Answer any two:

[2 × 9 = 18]

- Explain the operating principle of universal motor on dc supply. Explain the role of commutator. Draw suitable diagrams.
- List the criteria to obtain rotating magnetic field in split phase induction motor. Explain the terms:
 - Cage type rotor
 - Slip
- Draw circuit diagrams (symbolic diagrams) of all types of split phase induction motor. Out of these, name the motor famous for
 - best power factor during running
 - very small starting torque
 - Good starting torque as well as good power factor

SV-6

Total No. of Pages : 3

Seat No.	
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First Year Engineering (All Branches) (Semester - I & II)
(New) Examination, May - 2018
BASIC CIVIL ENGINEERING
Sub. Code : 59179

Day and Date : Tuesday, 08 - 05 - 2018
Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

- Instructions :**
- 1) All questions are compulsory.
 - 2) Figure to the right indicate full marks.
 - 3) Make suitable assumptions wherever Necessary and mention it clearly.
 - 4) Use of non-programmable calculator is allowed.

SECTION-I

- Q1) a)** The subject 'Basic Civil Engineering' is of vital importance to the all branches of engineering. Comment on this statement with suitable illustrative examples. **[8]**

OR

- a) Enlist various principles of building planning. Explain any three of them in brief. **[8]**
- b) Write short note on orientation of building. **[4]**
- c) Explain the Bylaws: **[4]**
 - i) Height of Building
 - ii) Building line and control line

Q2) Answer the following:

- a) What is bearing capacity of soil? Explain its importance in building Construction. **[6]**
- b) Give classification of shallow foundation. Explain any two types in detail. **[6]**
- c) What is deep foundation? Explain any one deep foundation with neat sketch. **[6]**

P.T.O.



SV-6

- Q3) a) Enlist various building materials. State and explain various types of cement with their properties and use. [8]

OR

- a) Write a note on Preservation of timber and seasoning of timber. [8]
 b) Differentiate between load bearing and framed structure. [4]
 c) Write a note on various types of loads considered in design of building. [4]

SECTION-II

- Q4) a) Explain how surveyor's compass differs from prismatic compass? What are the temporary adjustments of compass? [4]
 b) What is offset? What are the types of offset? Which instruments are used for offsetting? [4]
 c) The distance between two stations was measured with a 20 m chain and was found to be 1200 m. The same distance was measured with 30 m chain and was found to be 1195.40 m. If the 20 m chain was 5 cm too short, what was the error in the 30 m chain? [8]

OR

- c) Observed bearings for a closed compass traverse are given below. Find the local attraction at each end of the affected station and correct all bearings. Tabulate the data and results. Find also included angles. Show all calculations. [8]

Line	PQ	QR	RS	ST	TP
F.B.	S 85° W	S 30° W	N 55° E	N 63° E	N 27° W
B.B.	N 85° E	N 30° W	S 50° W	S 73° W	S 32° E

- Q5) a) Attempt Any Two questions from following:

- i) The following readings were recorded by a planimeter with anchor point inside the figure. I.R. = 9.918 F.R. = 4.254 M = 100 cm² C = 23.521 Calculate area of the figure when it is observed that zero mark of the counting disc passes the index mark once in anticlockwise direction. [4]
 ii) State uses of Total station. [4]
 iii) Define: Contour interval, CP, HI, BS. [4]

SV-6

- b) The following staff readings were observed on a continuously sloping ground along the center line of a road; with the help of a dumpy level and 4 m staff at 20 m interval. The first reading was taken on starting point of R.L. 350 m.

0.540, 1.245, 2.375, 3.885, 1.245, 2.560, 3.780, 0.875, 1.625, 2.960, 3.425, 3.830.

Enter the readings in a page of level book. Find R.L.s by Rise and Fall method. Apply usual checks. Determine longitudinal gradient of the road. [10]

- Q6) a) Draw a labeled diagram of cross section of road in cutting. [4]
 b) Draw cross section of 'Broad gauge railway track' and explain functions of various components. [4]
 c) Along with neat sketch explain components of Earthen Dam. [4]
 d) Explain with neat diagram functions of following units in water treatment plant: [4]
 i) Aeration unit
 ii) Flocculation tank
 iii) Filtration tank
 iv) Chlorination Tank

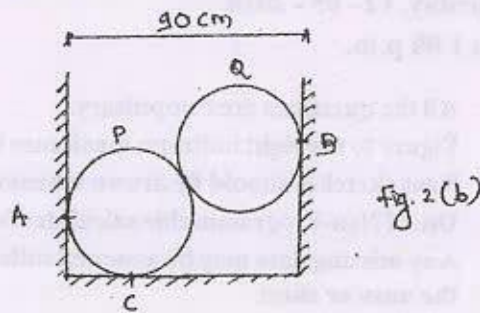
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SV-7
[4]

Q2) a) Define the following terms:-

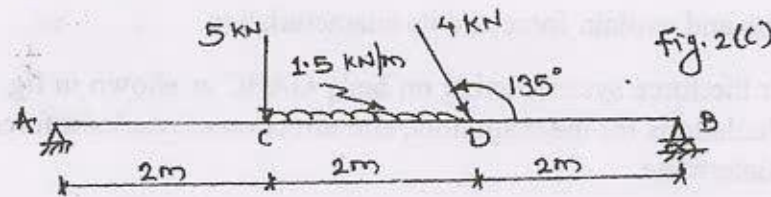
- Resultant
- Equilibrant
- Moment
- Couple

b) Two smooth spheres 'P' and 'Q' each of radius 25 cm and weighing 500 N, rest in a horizontal channel having vertical walls in fig. 2 (b). If the distance between the walls is 90 cm, make calculations for pressure exerted on the walls and floor at point of contact 'A', 'B' and 'C'. [14]



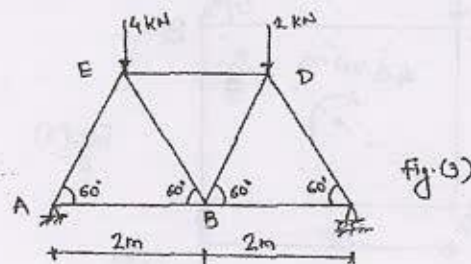
OR

b) A beam AB of 6m span is loaded as shown in fig. 2 (c). Determine the reactions at 'A' and 'B'. [14]



Q3) a) Write note methods of analysis of truss. [4]

b) Determine the reactions and forces in each members of a simple triangle truss supporting two loads as shown in fig. (3). [12]



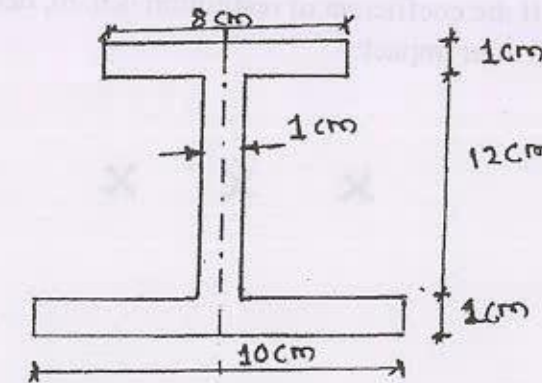
SV-7

SECTION - II

Q4) a) Discuss following terms:- [4]

- Centroid
- Center of gravity
- Moment of inertia
- Radius of gyration

b) Determine the polar moment of inertia of the I-section shown in fig. (4). Also make calculations for the radius of gyration with respect to X-axis and Y-axis. [12]



Q5) a) State and explain work-energy principle. [4]

b) A man weighing 750N stands on the floor of a lift. Determine the pressure exerted on the floor when

- the lift moves upward with an acceleration of 2.5 m/s^2 ,
- the lift moves downward with an acceleration of 2.5 m/s^2 .
- If 900N pressure is to be exerted on the floor, then what acceleration the lift should move upward? Use D'Alembert's principle. [14]

OR

SV-7

- b) A train weighing 4000 kN has a frictional tractive resistance of 5N/kN of weight. Determine the steady pull which the locomotive must exert if the speed of the train is to be increased from 30 Km/Hr to 60 Km/Hr within a period of 1.5 minutes. [14]

Q6) a) Explain s - t, v - t and a-t diagrams. [3]

b) Explain types of impact. [5]

- c) A ball of mass 30 kg moving with a velocity of 7m/s strikes directly on another ball of mass 12kg moving in opposite direction with velocity of 12 m/s. If the coefficient of restitution is 0.70, determine the velocity of each ball after impact. [8]

x x x

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Total No. of Pages : 4

Seat No.

F.E. (All Branches) (Semester - I & II)

Examination, May - 2018

APPLIED MECHANICS

Sub. Code : 59185

Day and Date : Saturday, 12 - 05 - 2018

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

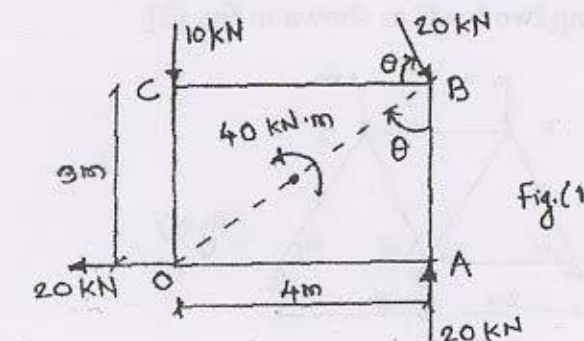
- Instructions :
- 1) All the questions are compulsory.
 - 2) Figure to the right indicates maximum marks for the question.
 - 3) Neat sketches should be drawn whenever necessary.
 - 4) Use of Non-Programmable calculator is allowed.
 - 5) Any missing data may be assumed suitably and clearly highlighted in the answer sheet.

SECTION - I

Q1) a) State and explain force and its characteristics. [4]

- b) For the force system acting on body OABC as shown in fig. (1), make calculations for the magnitude and direction of resultant force. Proceed to determine [12]

- i) distance of resultant from point 'O' and
- ii) the point where resultant meets the X-axis and Y-axis.



P.T.O.



Attempt any four.

- a) Using Taylor's series method find the value of y at $x = 0.1$ and $x = 0.2$ from $\frac{dy}{dx} = x^2y - 1; y(0) = 1$ [5]
- b) Solve by Euler's method $\frac{dy}{dx} = \frac{y-x}{y+x}; y(0) = 1$ at $x = 0.1$ with $h = 0.02$. [5]
- c) Solve the following by Euler's modified method $\frac{dy}{dx} = \log_{10}(x+y)$ with $y(0) = 2$ at $x = 0.2$ with $h = 0.2$ [5]
- d) Use Runge - Kutta method of fourth order to find $y(0.1)$, given that $\frac{dy}{dx} = 3e^x + 2y, y(0) = 0$ and $h = 0.1$ [5]
- e) Solve the differential equations $\frac{dy}{dx} = 2y + z$ and $\frac{dz}{dx} = y - 3z$ for $x = 0.1$ using fourth order Runge - Kutta method. Given that $y(0) = 1, z(0) = 0.5$. Take $h = 0.1$ [5]

SECTION - II

Attempt any three of the following.

- a) Evaluate the integral $\int_0^{\infty} x^7 e^{-2x^2} dx$ [5]
- b) Prove that $\int_0^{\pi/2} \tan^p \theta d\theta = \frac{\pi}{2} \sec \frac{p\pi}{2}$ [5]
- c) Evaluate $\int_0^{\infty} \frac{1 - \cos mx}{x} e^{-x} dx$, where m being a parameter. [5]
- d) Prove that $\frac{d}{dx} \operatorname{erf}(ax^n) = \frac{2an}{\sqrt{\pi}} x^{n-1} e^{-a^2 x^{2n}}$ [5]

Attempt any three of the following.

- a) Trace the curve $xy^2 = a^2(a-x)$ [5]
- b) Trace the curve $r = a \cos 2\theta$ [5]
- c) Find the length of arc of curve $r = a(1 - \cos \theta)$ which lies outside the curve $r = a \cos \theta$ [5]
- d) Trace the curve $x^3 + y^3 = 3axy$ [5]

Attempt any four of the following.

- a) Evaluate $\iint_A \frac{xy}{\sqrt{1-y^2}} dx dy$ where A is the area in the positive quadrant of the circle $x^2 + y^2 = 1$. [5]
- b) Find by double integration the area inside the circle $r = a \sin \theta$ and outside the cardioid $r = a(1 + \cos \theta)$ [5]
- c) Change the order of integration and hence evaluate $\int_0^{2+\sqrt{4-y^2}} \int_{2-\sqrt{4-y^2}}^y dx dy$ [5]
- d) Change into polar co-ordinates and hence evaluate $\int_0^a \int_y^a \frac{x^2 dx dy}{(x^2 + y^2)^{3/2}}$ [5]
- e) Find the x - coordinate of the centre of gravity of the area bounded by the parabola $y^2 = 4x$ and $2x - y - 4 = 0$. [5]



Seat No.	
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F.E. (Part - II) (Semester - II) (New)
Examination, April - 2018
ENGINEERING MATHEMATICS -II
Sub. Code :59933

Day and Date : Tuesday, 24- 4 - 2018

Total Marks : 100

Time : 10.00 a.m. to 1.00 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) Use of non-programmable calculator is allowed.
 - 4) Assume suitable data if necessary.

SECTION - I

Q1) Attempt any Three.

- a) Solve $(2xy + y - \tan y)dx + (x^2 - x \tan^2 y + \sec^2 y)dy = 0$ [5]
- b) Solve $(xy^3 + y)dx + 2(x^2y^2 + x + y^4)dy = 0$ [5]
- c) Solve $x \log x \frac{dy}{dx} + y = \log x^2$ [5]
- d) Solve $\frac{dy}{dx} = y \tan x - y^2 \sec x$ [5]

Q2) Attempt any Three.

- a) A resistance of 100 ohms, an inductance 0.5 henries are connected in series with a battery of 20 volts. Find the current in the circuit at $t = 0.5$ sec, if $i = 0$ at $t = 0$. [5]
- b) Find the orthogonal trajectory of the family of parabolas $y^2 = 4ax$ [5]
- c) A body originally at 80°C cools down to 60°C in 20 minutes, the temperature of the air being 40°C . Find [5]
 - i) when the temperature will be 50°C and
 - ii) temperature of a body after half hour.
- d) If 30% of radioactive substance disappeared in 10 days. How long will it take for 90% of it to disappear? [5]

P.T.O.



Q5) Attempt any four of the following :

- If $u = e^{xyz}$; find $\frac{\partial^3 u}{\partial x \partial y \partial z}$
- If $z = f(x, y)$ and $x = uv$; $y = u^2 - v^2$, Prove that $2(u^2 + v^2) \frac{\partial z}{\partial y} = u \frac{\partial z}{\partial u} - v \frac{\partial z}{\partial v}$.
- If $y = x \cos u$ then find $\left(x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} \right)$ and $\left(x^2 \frac{\partial^2 u}{\partial x^2} + 2xy \frac{\partial^2 u}{\partial x \partial y} + y^2 \frac{\partial^2 u}{\partial y^2} \right)$.
- If $x = r \cos \theta$, $y = r \sin \theta$; evaluate $\frac{\partial(x, y)}{\partial(r, \theta)}$ and $\frac{\partial(r, \theta)}{\partial(x, y)}$.
- Find the maximum and minimum values of $x^3 + 3xy^2 - 3x^2 - 3y^2 + 4$.

Q6) Attempt any three of the following :

[15]

- Solve the following system of equations by Gauss elimination method.
 $3x - y + 2z = 12$, $x + 2y + 3z = 11$, $2x - 2y - z = 2$
- Solve the following system of equations by Jacobi's iteration method
 (Carry out 4 iterations)
 $10x + y - z = 11.19$, $x + 10y + z = 28.08$, $-x + y + 10z = 35.61$
- Solve the following system of equations by Gauss-Seidal method
 (Carry out 4 iterations)
 $8x - 3y + 2z = 20$, $4x + 11y - z = 33$, $6x + 3y + 12z = 35$
- Find the largest eigen value the matrix $A = \begin{bmatrix} 2 & 3 & 2 \\ 4 & 3 & 5 \\ 3 & 2 & 9 \end{bmatrix}$ by power method

with $X = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ as a base vector. (Carry out 3 iterations)



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Total No. of Pages : 3

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F.E. (All Branches) (Semester - I) Examination, December - 2018
ENGINEERING MATHEMATICS - I

Sub. Code : 59177

Day and Date : Saturday, 08 - 12 - 2018

Total Marks : 100

Time : 02.30 p.m. to 05.30 p.m.

- Instructions :
- 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Use of non-programmable calculator is allowed.

SECTION - I

Q1) Attempt any three of the following :

[15]

- a) Reduce matrix A to its normal form and hence find rank if

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

- Solve the equations if they are consistent
 $x + 2y - 3z = -z$; $3x - y + 4z = 3$; $6x + 5y + z = -3$.
- Apply matrix method to solve the equations
 $x + 3y - 2z = 0$; $2x - y + 4z = 0$; $x - 11y + 14z = 0$
- Find the values of λ for which following equations are consistent
 $x + y + z = 1$; $2x + y + 4z = \lambda$; $4x + y + 10z = \lambda^2$

Q2) Attempt any three of the following :

[15]

- Examine for dependence or independence of vectors
 $[1 \ 1 \ -1 \ 1]$; $[1 \ -1 \ 2 \ -1]$; $[3 \ 1 \ 0 \ 1]$
- Find eigen vector for least eigen value of a matrix

$$A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$$

P.T.O.



SE - 10

- c) Find eigen values of matrices
- A^{-1}
- ;
- A^T
- ;
- $(\text{Adj. } A)$
- and
- $(5A)$
- if matrix

$$A = \begin{bmatrix} 3 & 10 & 5 \\ -2 & -3 & -4 \\ 3 & 5 & 7 \end{bmatrix}$$

- d) Verify Caley-Hamilton's theorem for the matrix

$$A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

Q3) Attempt any four of the following :

[20]

- Prove that $(1 + i\sqrt{3})^8 + (1 - i\sqrt{3})^8 = (-2)^8$.
- Prove that $\left[\frac{\sin(7\theta)}{\sin \theta} \right] = 7 - 56\sin^2\theta + 112\sin^4\theta - 64\sin^6\theta$.
- Solve the equation and find all the roots $x^5 = (1 + i)$.
- Solve the equation $7\cos hx + 8\sin hx = 1$.
- Prove that $\tanh^{-1}(z) = \frac{1}{2} \log \left(\frac{1+z}{1-z} \right)$.

SECTION - II

Q4) Attempt any three of the following :

[15]

- Expand $\log(1 + \sin x)$ by Maclaurin's theorem in power of x .
- Show that $e^{e^x} = e \left[1 + x + x^2 + \frac{5}{6}x^3 + \frac{5}{8}x^4 + \dots \right]$.
- Expand $2x^3 + 7x^2 + x - 6$ in powers of $(x - 2)$.
- Evaluate $\lim_{x \rightarrow 1} \left[\frac{x}{x-1} - \frac{1}{\log x} \right]$.

Seat No.	
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F.E. (Part - I) (All Branches) (Semester - I & II) (CBCS) (Revised)
Examination, December - 2018
BASIC ELECTRICAL ENGINEERING
Sub. Code : 71812

Day and Date : Saturday, 01 - 12 - 2018

Total Marks : 70

Time : 02.30 p.m. to 05.00 p.m.

- Instructions :
- 1) Attempt 3 questions from each section.
 - 2) Figures to the right indicate full marks.
 - 3) Draw a neat labeled diagrams as apart of Explanation.
 - 4) In case of any missing data, assume suitable value. State it clearly.

SECTION - I

- Q1) a)** State & explain Kirchhoff's laws. [6]
b) Two batteries A & B are connected in parallel across a load resistance of 10 ohm. The emf & internal resistance of battery A & B are 35 volts, 5 ohm and 40 volts, 5 ohm respectively, using mesh or node analysis, Find [6]
 i) Current in battery A,
 ii) Current in battery B.
 iii) Current in load resistance.
- Q2) a)** Define [6]
 i) Magnetic field
 ii) Magnetic Field Intensity
 iii) Reluctance
b) Distinguish between electric & magnetic circuit. [5]
- Q3) a)** Define power factor and state disadvantages of low power factor. [5]
b) A resistance of 20 ohm and inductance of 47.8 mH are connected in series across 200 volts, 50 Hz ac supply. Find [6]
 i) Inductive Reactance,
 ii) Impedance,
 iii) Power factor.



P.T.O

4) Answer any TWO.

- a) Explain Ohms Law for Electric circuits. Also state factors effect on Resistance. [6]
- b) Explain how single phase sinusoidal voltage is generated in AC. [6]
- c) State & explain types of induced EMF's. Compare statically and dynamically induced EMF. [6]

SECTION - II

15) a) Explain the terms: Line voltage, Line current, Phase voltage, Phase current. [6]

- b) Compare star connected 3 phase load with delta connected 3 phase load in terms of phase voltage, phase current, power drawn, other advantages related to the configuration. [6]

26) a) Describe construction & working of CFL. Also state its advantages & disadvantages. [5]

- b) Explain the construction & working of HRC fuse. Also state its advantages & disadvantages. [6]

27) a) Explain the operation of Single phase transformer on No load. Also draw related phasor diagram. [5]

- b) The primary winding of Single phase transformer is connected to a 200V, 50Hz supply. The secondary winding has 1000 turns. If the maximum value of flux is 2.01 mWb, determine [6]

- i) The number of primary turns
- ii) The Secondary induced voltage
- iii) The net cross sectional area if the flux density has maximum value of 0.365 Tesla.

8) Answer any TWO.

- a) State and Explain Power Losses occurred in Transformer. [6]

b) A 1100/220 V, 20 KVA, 50 Hz single phase transformer operates has 100W iron loss and 80W copper loss at half of the full load. When this transformer operates at full load with 0.8 pf, find

- i) Full load primary and secondary currents
- ii) Full load copper loss
- iii) Full load efficiency

[6]

c) Draw & Explain the single line diagram of a typical power system from the Point of Generation to Point of Utilization. [6]



Q6) Solve any one.

a) Solve.

- i) A square based pyramid with base side 35 mm and axis height 55 mm tilts parallel to FRP around one of its base edge on HRP to have the apex 40 mm level above HRP, it is cut by a vertical plane making an angle of 30° to FRP and passing through a point on axis 20 mm below apex, complete the sectional front view and top view and true shape of the sectioned surface. [7]
- ii) Fig. shows two views of hexagonal prism cut by plane at the top and by circular plane at the base corner. Draw the development of remaining lateral surface. [6]

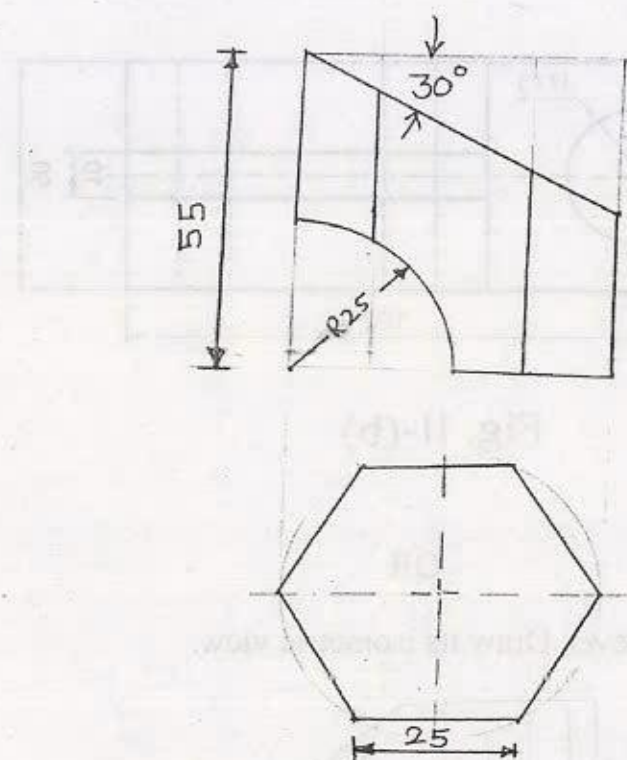


Fig II (c)

OR

b) Solve.

A cylinder of 50 mm diameter, 75 mm height and having its axis vertical, is cut by a section plane, perpendicular to VP, inclined at 45° to HP and intersecting the axis 40 mm above the base. Draw its front view, sectional top view, true shape of the section. Also draw the development of lateral surface of remaining portion of cylinder. [13]



Seat
No.

F. E. (All Branches) (Part - I) (Semester - I & II) (Revised)
Examination, May - 2018
ENGINEERING GRAPHICS

Sub. Code : 59180

Day and Date : Tuesday, 15 - 05 - 2018

Total Marks : 100

Time : 09.30 a.m. to 01.30 p.m.

- Instructions :**
- 1) All questions are compulsory.
 - 2) Retain all construction lines.
 - 3) Use both sides of drawing paper.
 - 4) Assume suitable data if necessary and mention it clearly.
 - 5) All dimensions are in mm.

Q1) a) Solve any three:

- i) Complete the projection of line AB if,
 - I) Its grade is $+40\%$ w.r.t. A
 - II) Its bearing is $S 60^\circ E$ w.r.t. A
 - III) Its FV length is 50 mm.

Determine its true length. Refer fig. 1-a. [4]

- ii) Line CD is 45 mm long is parallel to AB and 25 mm away from it, complete the projection of line CD. Refer fig. 1-b. [4]

- iii) Complete projection of line PQ, 30 mm long and perpendicular to AB. The point Q is on line AB. Refer fig. 1-c. [4]

- iv) Find true shape of triangle PQR and measure its perimeter. Refer fig. 1-d. [4]

- b) A thin circular plate of 60 mm diameter has a point A on its circumference in HRP. Draw its projection with its centre 45 mm in front of FRP and 25 mm above HRP and diameter makes an angle of 30° with FRP. [13]

- Q2) A cone with 40 mm diameter and height 60 mm rests on HP such that the base is inclined at 35° to horizontal and top view of the axis is inclined at 45° to VP. Draw its projection if apex of cone is away from observer when viewed from front. [13]



Q3) Solve any two :

- A perfect gas relation between pressure P and volume V is isothermal expansion, given as $PV = \text{Constant}$. Draw a curve of isothermal expansion of enclosed volume of gas is 3 m^3 of gas corresponds to pressure of 5 kg/cm^2 . [6]
- Draw the involute of regular hexagon of side 20 mm . [6]
- A stone is thrown from the top of the building 10 m in height, in an upward direction. After reaching maximum height of 15 m in corresponding horizontal travel of 5 m the stone starts descending down. Determine the position of the point ahead of building where stone falls on the ground. [6]

Q4) A following Fig. 11-(a) shows a view of Bracket. Draw the following views [24]

- Sectional front view along sectional A-A in the direction 'X'
- Top view
- Left hand side view. Give necessary dimensions

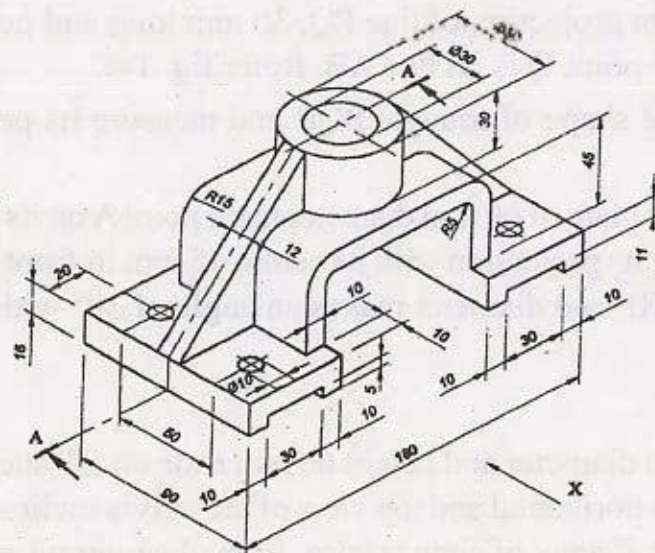


Fig. II-(a)

[13]

Q5) Solve any one.

- Fig shows the front and top views. Draw its isometric view.

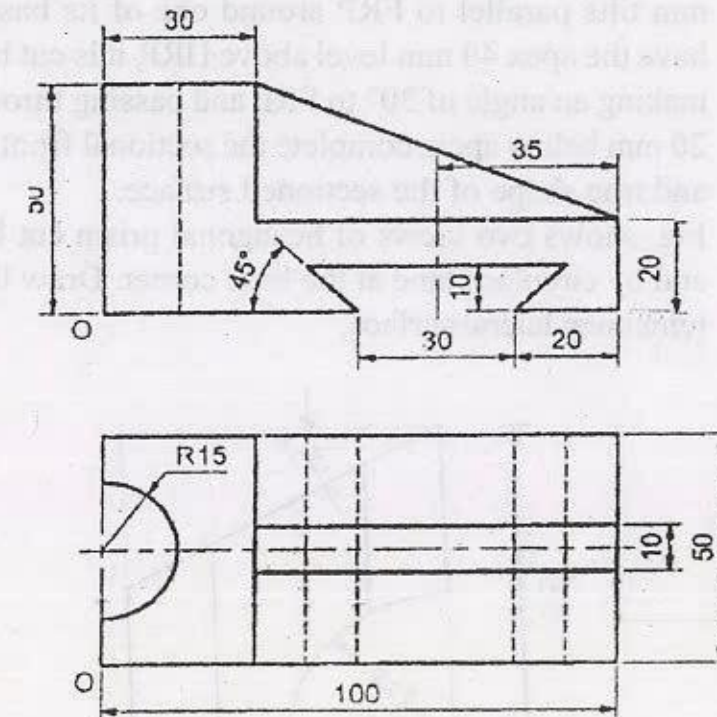


Fig. II-(b)

OR

- Fig shows the views. Draw its isometric view.

[13]

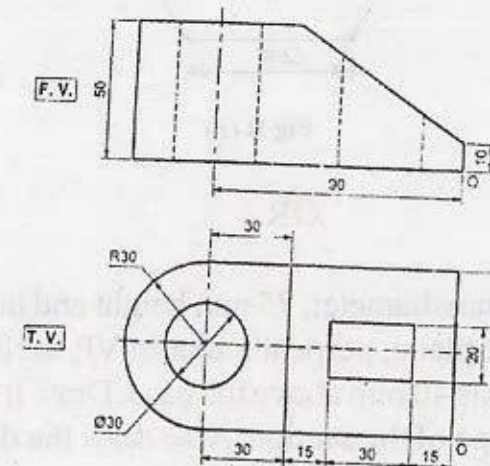


Fig. II-(b)